

Full Length Research Paper

Patient knowledge and behavioral factors leading to non-adherence to tuberculosis treatment in Khartoum State, Sudan

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Received 22 August, 2016; Accepted 6 October, 2016

Although tuberculosis is a curable and preventable disease, defaulting from treatment can prolong infectiousness leading to increased transmission, an increased risk of drug resistance, relapse and death. Our objective was to identify patient related determinants (including knowledge and awareness, opinion about TB services and behavioral factors) of treatment defaulting among TB patients in Khartoum State, Sudan. Between May 2010 to May 2011., we conducted a case control study where the patients defaulting from treatment were considered as 'cases' and those completing treatment as 'controls'. There were 2727 TB patients who attended TB treatment clinics during study period. Out of these 2399 patients (86%) had continued their treatment while 328 patients (14%) had interrupted it. 105 cases were traced and interviewed. In addition 210 patients who had continued their treatment were included as controls. In the multivariate analysis the variables that remained in the model were: rural residence (OR= 2.16; 95% CI= 1.19-3.90), "had never heard about TB before had it (OR= 1.81; 95%CI=1.02-3.20), lack of knowledge on when to stop TB medication (OR= 2.00; 95% CI= 1.10 -3.64), less support by families, friends and colleagues (OR= 3.23; 95% CI= 1.62- 6-46), too many patients when visiting the TB center (OR= 2.24; 95% CI =1.29 - 3.88), and lack of counseling about TB and its treatment (OR= 4.79; 95% CI= 2.57 -8.95). The results of this study show that patient's knowledge about TB, its treatment and the experienced professional and peer support are associated with TB treatment continuation. Hence, adequate counseling of patients, including counseling of their peers for social support, and adequate training of the health care providers who have enough time to attend to their patient's need are potential measures to reduce TB treatment default.

Key words: Tuberculosis, non-adherence, adherence, defaulter.

INTRODUCTION

Tuberculosis (TB), is a global health concern for both developing and developed countries (Nezenega et al.,

2013). It has reached epidemic proportions in many developing countries, with a third of world population

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being infected with *Mycobacterium tuberculosis* (Khan et al., 2006). Although it is a curable and preventable disease, Worldwide TB is the second most common cause of death in adults attributable to a single infectious agent (World Health Organization, 2015). In 2010, it was estimated that in Sudan there were 209 cases of active TB per 100.000 of the population with an annual incidence of new cases of 119/100.000, resulting in approximately 37.000 new cases each year. Hence, Sudan shoulders about 15% of TB burden in the Eastern Mediterranean Region and has the second highest active TB prevalence of the countries in this region. In addition, the estimated death rate related to TB, including HIV infected TB patients, was 24/100.000 per year (Federal Ministry of Health, Sudan, 2011).

The health authority of Sudan subscribes to the strategies for TB prevention and treatment recommended by the WHO including the therapeutic regimens given under direct observation short course therapy (DOTS) programme. Despite the efforts that had been undertaken by health authorities still some patients fail to adhere to TB treatment and eventually default before completing the treatment. As defined by the WHO, patients who fail to collect their TB treatment for 2 consecutive months are reported as defaulters (World Health Organization, 2002). The role of human behavior in health and illness has been increasingly recognized (Suleiman et al., 2014).

In any cultural context, a precondition of health-seeking behavior is the recognition and interpretation of symptoms by individuals affected by a disease and by those around them (Ayisi et al., 2011).

In the case of TB, personal experiences, perceived etiology of the disease, associated beliefs and attitudes could be important for appropriate health-seeking behavior, i.e. completing treatment. Hence, health education and counselling to TB patients may increase successful treatment completion (Ayisi et al., 2011; Rubel and Garo, 1992).

Many studies have addressed behavioral, biological, socio-demographic factors, and patient knowledge factors that were associated with TB treatment default or leading to delays in seeking TB treatment (Carolyn et al., 2009). Thus, understanding of patient knowledge, opinion, cultural beliefs and behavioral patterns, in addition to knowledge of health staff and their practice and their association with defaulters from TB treatment is crucial.

The present study was conducted to identify patient related determinants (including knowledge and awareness, opinion about TB services and behavioral factors) of treatment defaulting among TB patients.

MATERIALS AND METHODS

This was an observational case control study where the patients defaulting from treatment were considered as 'cases' and those completing treatment as 'controls'.

Setting

This study was conducted in Khartoum State. In 1993, the Ministry of Health in Khartoum State established a tuberculosis control program. The decentralized healthcare system in Khartoum is divided into seven districts and 19 health areas. Its health facilities include 43 hospitals, 147 health centers, 185 NGOs centers, 235 dispensaries and 365 primary health care units. TB services are delivered in primary health care along with all other routine health services. A registered nurse is designated responsible for treatment and follow up for continuation of treatment in the primary health care unit. This primary health care unit is the basic unit of management of the program and also the unit of reporting. Personnel at the primary health care unit responsible for tuberculosis services include a medical assistant, a laboratory technician and a clerk. The program provides care through the DOTS strategy (Directly Observed Treatment with Short course chemotherapy) as recommended by WHO. TB patients receive their treatment through 53 TB treatment units distributed all over the State (Suleiman and Sodemann, 2009).

Population

The interview process was done in the period from 1st of May 2011 to 15th of July 2011, but in order to reach the target defaulted group for the interviews we used the clinics records for the patients registered in the period from May 2010 to 2011. The inclusion criteria for both cases and controls were; patients age more than 15 years and clinically and laboratory diagnosed as tuberculosis, registered at the treatment units in Khartoum States. Cases were those patients identified as TB treatment defaulting during the data collection period. Following identification of each case (defaulter) without exclusion criteria, the next 2 subsequent patients without exclusion criteria, who had completed their treatment without defaulting, and requested to come for follow up, either to do the final sputum smear or to collect the smear results, in the same TB treatment unit or the near one in the same area, were taken as control into the study. The patients were excluded from the study if they were: too ill for interview, had a psychiatric illness, or gave incorrect address and could not be traced.

Definition of variables

The following definitions were applied according to the World Health Organization (WHO, 2002). Pulmonary TB: a patient with tuberculosis disease involving the lung parenchyma. Extra-pulmonary TB: a patient with tuberculosis of organs other than the lungs (e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints and bones, meninges). A patient in whom both pulmonary and extra-pulmonary TB has been diagnosed was classified as pulmonary TB (World Health Organization, 2002).

Categories of treatment outcomes'

Treatment default: is defined as an interruption of TB treatment for two or more consecutive months during the intended treatment period (World Health Organization, 2002). Adherence to TB treatment may be defined as the extent to which the patient's history of therapeutic drug-taking coincides with the prescribed treatment (Urquhart, 1996). Complementary and alternative medicine (CAM): is a medical intervention which is not taught widely at medical schools or is not generally available in hospitals, seek folk remedies treatment: are those patients who seek alternative treatment other than TB recommended therapeutic chemotherapy (herbal, traditional and spiritual treatment) (Hirofumi et al., 2006).

Data collection

Information on demographic factors, disease related factors and treatment related factors were retrieved from patients' medical records. In addition, a face to face interview was held, using a standardized questionnaire by trained interviewers to elicit information on the various factors possibly associated with treatment defaulting. All TB patients who had defaulted prior to data collection period were identified and their address had been retrieved from patient records. Then, the interviewers used the following sequence of contact attempts: calls – first to the patient and thereafter to known family members or friends - home visits - first to patient and thereafter to known family members or friends. Before the start of data collection the interviewers had been trained on how to interview the respondents, and had been given instructions on how to fill the questionnaire. After that, pretesting was conducted by interviewing few patients. Based on the pretesting results the questionnaire was used without any major changes. The data collected included demographic and clinical variables (age, gender, site of TB infection, co-infection with HIV), patient's knowledge of TB and its treatment, the patient's rating of the TB treatment services provided and behavioral factors (Rubel and Garo, 1992; Finlay et al., 2012; Chuah, 1991; Marluca et al., 2012; Comolet et al., 1998; Jaggarajamma et al., 2007; Nyi et al., 2001; Pardeshi, 2010; Muture et al., 2011). The abbreviated list of questions asked is detailed in Tables 1 and 2.

Statistics

The sample size was calculated according to Fleiss (1981) using a two sided type one error of 0.05 and a power of 80% and the ability to detect an odds ratio of 2.0 with a exposure frequency of 30% in the control group and a ratio of cases to controls of 1:2. This yielded a sample size of 105 cases and 210 controls. Data were reviewed for consistency and completeness. Data analysis was performed in Statistical package of Social Sciences (SPSS) version 16. The demographic characteristics of cases and controls were compared using χ^2 test for qualitative variables and student's *t* tests for continuous variables. Univariate and multivariate analysis were conducted. Descriptive statistics were calculated for all dependent variables. Logistic regression was used to calculate the odds ratio and its 95% confidence interval. Variables that were related to treatment default with a *p*-value less than 0.20 were entered in a multivariate model, using a backward approach (Fleiss, 1981).

Ethical considerations

Ethical approval was obtained from the Ministry of Health Khartoum State' ethical Committee. Permission was granted by public committee leaders in the localities through official letters. Informed verbal consent was secured from every eligible patient included in this study before the interview. Privacy and confidentiality was maintained. Prior to the arrival of the data collection team the respondents had been informed regarding all relevant aspects of the study, including the purpose of the study, interview process and potential benefits. The interviewers introduced themselves to respondents and outlined the scope of interview and its approximate length to the potential respondents at the beginning of each interview.

The respondents had been informed that the participation was entirely voluntary, and that privacy and confidentiality will be maintained during data processing and reporting. Potential respondents also were informed that they had the right to refuse to participate, or to end the interview at any time.

RESULTS

Patients

There were 2727 TB patients who attended TB treatment clinics during study period. Out of these, 2399 patients (86%) had completed their treatment while 328 patients (14%) had interrupted it. Out of these, 185 patients had defaulted prior to the data collection period. Hence, 143 patients were potentially eligible as cases. Of these, 15 had given a wrong address and 12 had moved out of Khartoum State and could not be interviewed. A further 11 patients refused the interview. Hence, 105 cases were traced and interviewed. In addition 210 patients who had completed their treatment were included (controls).

Among cases, 70.5% were males and 29.5% were females compared to 60.9% of males and 39.1% of females among the controls. The mean ages were respectively 32.8 years and 34.6 years for cases and controls. 53.3% of the study cases were aged 15 to 30 years and 46.7% were more than 30 years old compared to respectively 47.6% and 52.4% for controls. Among cases, 61% were living in urban area and 39% in rural area compared to respectively 80.5% and 19.5% for controls. Also about 61% of cases were ready to stop taking treatment according to the health care workers advice and 39% can stop taking treatment due to other factors such as feeling better compared to respectively 81.4 and 18.6% for controls. However, 29.5% of these cases were treated differently by their families, friends and colleagues of having TB compared to controls (11.0%). Hence, cases felt that the medical center in which they were treated had more attendants than controls (59 vs 42.9%). Compared to controls, cases were less often received less health education (41.9 vs 11.9%) while more of them did not hear about TB disease before they had it (44.9 vs 27.1%). The demographic and TB characteristics are given in Tables 1 and 2.

Patient's knowledge and opinion

The distribution of factors related to knowledge of TB and its treatment as well as the opinion and attitudes of cases and controls is given in Table 1 and 2. Univariate odds ratios and their 95% confidence intervals are given in Table 3 and 4. In general, cases were more likely to lack adequate knowledge of TB such as; had never heard about TB before had it (OR: 1.93, 95% CI: 1.18-3.17), when to stop TB medication (OR: 2.81, 95% CI: 1.66-4.74), treatment duration (OR: 2.96, 95%CI: 1.62-5.41) and can TB be cured (OR: 2.54, 95%CI: 1.13-5.71). Hence, cases were more living in the rural areas (OR:2.64 and 95%CI: 1.57- 4.44) and having more social problems because they had TB. Especially, cases reported feeling more ashamed (OR:1.88,95%CI:1.04-3.39) and embarrassment because of having TB (OR:2.17,95% CI:1.16-4.07), and were less likely to

Table 1. Patients knowledge and awareness factors affecting non adherence to TB treatment.

Patients knowledge and awareness factors:	Cases (105)	Control (210)	P-value
Age – mean (SD)	32.8 (14.4)	34.6 (14.9)	
15 - 30 years	56 (53.3%)	100 (47.6%)	0.339
Over 30 years	49 (46.7%)	110 (52.4)	
Sex			
Male	74 (70.5%)	128 (60.9%)	0.98
Female	31 (29.5%)	82 (39.1%)	
Site of tuberculosis			
Pulmonary TB	92 (87.6%)	180 (85.7%)	0.39
Extra-pulmonary TB	13 (12.4%)	30 (14.3%)	
Residential locality			
City	64(61%)	169(80.5%)	0.000
Village	41(39%)	41(19.5%)	
Did you hear about TB before you had it?			
Yes	61(58.1%)	153(72.9%)	0.006
No	44(41.9%)	57(27.1%)	
What do you expect if you stop TB treatment?			
Know the consequences	95(90.5%)	183(87.1%)	0.251
Don' know the consequences	10(9.5%)	27(12.9%)	
Know the consequence if stop TB treatment			
Not cured	16(16.8%)	48(26.3%)	0.215
Relapse	42(44.2%)	80(43.7%)	
Start treatment again	12(12.7%)	22(12.0%)	
Died	25(26.3%)	33(18.0%)	
Treatment duration			
Known	76(72.4%)	186(88.6%)	0.000
Not known	29(27.6%)	24(11.4%)	
Mentioned the treatment duration			
6 months duration	39 (51.3%)	131(70.3%)	0.065
8 month duration	37(48.7%)	55(29.7%)	
Can TB be cured?			
Yes	91(86.7%)	198(94.3%)	0.020
No	14(13.3%)	12(5.7%)	
When should you stop taking treatment?			
When a health worker tells me	64(61%)	171(81.4%)	0.000
Others	41(39%)	39(18.6%)	
Are you ashamed to have TB?			
Yes	25(23.8%)	30(14.3%)	0.038
No	80(76.2%)	180(85.7%)	
Do you try to hide that you have TB?			0.560

Table 1. Contd.

Yes	24(22.3%)	42(20.0%)	
No	81(77.7%)	168(80.0%)	
Do your family, friends and colleagues treat you different because of TB?			
Yes	31(29.5%)	23(11.0%)	0.000
No	74(70.5%)	187(89.0%)	
How do you feel about being observed taking treatment?			
Embarrassed	23(21.9%)	24(11.4%)	0.012
Not embarrassed	82(78.1%)	186(88.6%)	

Table 2. Patients opinion about TB services and behavior factors affecting non adherence to TB treatment.

Patient behavior and opinion about TB services	Cases (Non-adherence) 105 (33.3%)	Control (adherence) 210 (66.7%)	P-value
Do you smoke?			
Yes	15(14.3%)	44(21%)	0.099
No	90(85.7)	166(79%)	
Do you use alcohol?			
Yes	7(6.7%)	18(8.6%)	0.364
No	98(93.3)	192(91.4%)	
Do you have AIDS?			
Yes	2(1.9%)	4(1.9%)	1.000
No	103(98.1%)	206(98.1%)	
Do you use intravenous drugs?			
Yes	1(1.0%)	2(1.0%)	1.000
No	104(99.0%)	208(99.0%)	
Do use other drugs?			
Yes	4(3.8%)	3(1.4%)	0.194
No	101(96.2%)	207(98.6%)	
What is your opinion on TB services?			
Good	99(95%)	205(97.6%)	0.118
Not good	6(5%)	5(2.4%)	
How do you rate the health workers attitude?			
Receptive	101(96.2%)	206(98.1%)	0.256
Unreceptive	4(3.8%)	4(1.9%)	
How do you rate the health center appearance?			
Suitable	91(86.7%)	173(82.4%)	0.21
Not suitable	14(13.3%)	37(17.6%)	
How do rate the number of patients at the TB center?			
Suitable	43(41%)	120(57.1%)	0.005
Not suitable	62 (59%)	90(42.9%)	
What was your average waiting time at the TB center?			
<60 min	94(89.5%)	195(92.9%)	0.211
>60 min	11(10.5%)	15(7.1%)	

Table 2. Contd.

Are you satisfied with the given TB treatment?			
Yes	97(92.4%)	198(94.3%)	0.515
Not	8(7.6%)	12(5.7%)	
Did you receive health education about the disease TB and its treatment?			
Yes	61(58.1%)	185(88.1%)	0.000
No	44(41.9%)	25(11.9%)	

Table 3. Distribution of Patients knowledge and awareness factors.

Patient knowledge and awareness factors:	OR	95% CI
Age group		
15 - 30 years vs. Over 30 years	0.80	0.50 -1.27
Sex		
Male vs.Female	1.53	0.93-2.53
Site of tuberculosis		
Pulmonary vs. Extra-pulmonary	1.18	0.60-2.37
Residential locality		
City vs Village	2.64	1.57- 4.44
Did you hear about TB before you had it?		
Yes vs No	1.93	1.18-3.17
What do you expect if you stop TB treatment		
Know the consequences vs Don' know the consequences	1.40	0.65-3.02
Treatment duration		
Known vs Not known	2.96	1.62 -5.41
Can TB be cured?		
Yes vs No	2.54	1.13-5.71
When should you stop taking treatment?		
When a health worker tells me vs Others	2.81	1.66-4.74
Are you ashamed to have TB?		
Yes vs No	1.88	1.04-3.39
Do you try to hide that you have TB?		
Yes vs No	1.19	0.67-0.21
Do your family, friends and colleagues treat you different because of TB?		
Yes vs No	3.41	1.86-6.22
How do you feel about being observed taking treatment?		
Embarrassed vs Not embarrassed	2.17	1.16-4.07

Table 4. Distribution of Patients opinion about TB services and behavior factors.

Patient opinion about TB services and behaviour factors	OR	95 %CI
Do you smoke? Yes vs No	1.59	0.84-3.02
Do you use alcohol? Yes vs No	0.76	0.31-1.89
Do you have AIDS? Yes vs No	1.00	0.18-5.55
Do you use intravenous drugs? Yes vs No	1.00	0.09-11.16
Do use other drugs? Yes vs No	2.73	0.60-12.44
What is your opinion on TB services? Good vs Not good	2.49	0.74-8.34
How do you rate the health workers attitude? Receptive vs Unreceptive	0.49	0.12-2.00
How do you rate the health center appearance? Suitable vs Not suitable	0.72	0.37-1.40
How do rate the number of patients at the TB center? Suitable vs Not suitable	1.92	1.20-3.09
What was your average waiting time at the TB center? <60 min vs >60 min	1.52	0.67-3.44
Are you satisfied with the given TB treatment? Satisfied vs Unsatisfied	1.36	0.54-3.44
Did you receive health education about the disease TB and its treatment? Received health education vs Not educated	5.34	3.02-9.44

have support of their families, friends and colleagues (OR:3.41, 95%CI: 1.86-6.22). The perception of health services was similar. However, cases had often received less counselling on TB and its treatment (OR: 5.34, 95% CI:3.02-9.44) and felt there were too many patients when visiting the TB center (OR:1.92,95%CI:1.20-3.09) (Tables 3 and 4).

Risk factors for defaulting

In the multivariate analysis the variables that remained in the model were residential locality (P value: 0.11, OR:2.16; 95% CI: 1.19-3.90), 'lack of knowledge on when to stop TB medication'(P value: 0.023, OR: 2.00; 95%CI:1.10-3.64), "had never heard about TB before had it (P value:0.041, OR: 1.81; 95%CI:1.02-3.20), 'less

support by families, friends and colleagues'(P value: 0.001; OR: 3.23; 95%CI: 1.62-6.46), 'too many patients when visiting the TB center'(P value: 0.004; OR: 2.24; 95%CI: 1.29 -3.88), and 'lack of counseling about TB and its treatment' (P value: 0.000; OR: 4.79; 95%CI: 2.57 - 8.95), (Table 5).

DISCUSSION

The present study showed that patients with less opportunity to receive health education and counseling about TB and its treatment and those living in the rural areas are at higher risk of defaulting TB treatment. Other potentially modifiable factors associated with TB treatment default identified in this study were lack of support by families, friends and colleagues, and

Table 5. Multivariate results: Patients knowledge and awareness, opinion about TB services and behavior factors leading to TB default.

Factor	P value	Odds Ratio (OR)	95% CI
Living in rural areas	0.011	2.16	1.19-3.90
When should you stop taking treatment?	0.023	2.00	1.10-3.64
Did you hear about TB before you had it?	0.041	1.81	1.02-3.20
Do your family, friends and colleagues treat you different because of TB?	0.001	3.23	1.62-6.46
How do rate the number of patients at the TB center?	0.004	2.24	1.29-3.88
Did you receive health education about the disease TB and its treatment?	0.000	4.79	2.57- 8.95

overcrowding of the TB centers and its associated issues of long waiting times. Our study observed a default rate of 14% among TB treatment patients in Khartoum State. This high default rate was similar to rates reported in previous studies conducted in Khartoum State [(Federal Ministry of Health, Sudan, 2011, Suleiman and Sodemann, 2009). This observed rate is much higher than the World Health Organization's recommended target rate of 3% (World Health Organization, 1994). Similar high default rates were reported in other developing countries e.g. in Ethiopia and India with default rates of 23 and 10%, respectively (Damte et al., 2013; Pradesh, 2010). Such high default rates has a negative impact on the treatment outcome and may lead to spread of disease, treatment failure, drug resistance and death (Muture et al., 2011). In the present study a substantial proportion of cases 44(42%), and controls (12%), did not receive health education and counseling when diagnosed with TB. While the intention of the TB-control program in Khartoum State is to provide adequate health education and counseling to patients diagnosed with TB, the fact that this did not happen in a substantial proportion of patients may be explained by shortage of health education personnel, increased health care burden, lack of training and supervision of health staff by the TB coordinators. This may indicate that the program and its allocated resources deserve a re-assessment.

Our observation that patients with less opportunity to receive health education and counseling about TB and its treatment increase the default rate confirms the results of previous studies conducted in both developed and developing countries (World Health Organization (WHO), 2002, Muture et al., 2011; Marlucia et al., 2012). However, Nyi from Malaysia did not find an association between health education and counseling and TB treatment default (Nyi et al., 2001). In general, a large proportion of participants in this study had low knowledge about TB, duration of treatment, and whether TB is curable or not. The knowledge and behavioral factors contributing to TB default may vary in different communities and populations. Part of this can be attributed to patients' traditions and beliefs. In addition, health services, health staff receptiveness and patients' opinions towards those services are also contributing factors. Moreover, TB is a

disease largely present in settings of the poor with limited resources. The association of TB treatment default with lack of family, friends and colleague support, rural residence and overcrowding of the TB centers has been recognized before as it was in this study (World Health Organization (WHO), 2002; Rubel and Garo, 1992; Marlucia et al., 2012; Ifebunandu et al., 2013). However, our findings were in contrast to those reported by Chuah (1991) and Nyi et al. (2001) from Malaysia.

In our study population, HIV infection and intravenous drug users (IVDU) were rare, as might be expected among the population of Khartoum state (unpublished data). With regard to HIV infection status, it was interesting to note that about 15% of TB patients were not screened, while the intention of the TB control program is to perform the HIV testing in all TB patients. This is another indication for the need of reassessment of the TB control program in Khartoum state. Surprisingly, behavioral factors including cigarette smoking, alcohol abuse, feeling ashamed and other stigmatizing factors were not associated with TB default in this study, in contrast to some earlier studies (Muture et al., 2011; Caylà et al., 2009). The findings of this study might help health providers and policy makers in Sudan and other developing countries in planning and developing health policies to strengthen TB control programs in general. Of special importance seems that there is insufficient staff dedicated to counseling and education of the patients as well as their social support networks. Also more efforts should be taken to enhance the community participation and upgrading of the health personnel's communication and counseling skills.

Some methodological aspects of this study need attention: Firstly, this study was conducted in Khartoum State, capital of Sudan which is the most populated state in Sudan. The population in this state could be safely stated to represent the whole country as most of the inhabitants come from various parts of Sudan. In addition, the TB patients included in this study were selected from all tuberculosis treatment units (health centers and hospitals) in the state. Thus, the generalization of the study findings to the total tuberculosis population in the state and Sudan could be done and seems logical as well as in the communities with similar

settings. Secondly, recall bias was minimized by reviewing the patient medical records and cross checking for each study variable and using a standardized questionnaire during the interview. Thirdly, the reliability of information gathered from each subject could not be counterchecked but questions about sensitive issues were carefully dealt with to maximize the reliability of the responses obtained. Fourthly, possible confounders were taken into consideration in the design (by restricting the diagnosis criteria) and by using logistic regression. Lastly, the major problem we faced during this study was how to reach the defaulting patients (cases) for this study. This problem was tackled stepwise. First, their medical records were traced and identified and all contact information was reviewed. Then, study personnel used the following sequence of contact attempts: calls – first to the patient and thereafter to known family members or friends - home visits - first to patient and thereafter to known family members or friends. Interestingly, it appeared during the study that many of the defaulting patients did not have access to mobile telephones, a risk factor not previously described nor evaluated in this study. The interviewers made an average of three attempts to contact each defaulter before deciding that a defaulter was a non-respondent.

Conclusions

This study confirms that health education and counseling to patients and their families on TB disease and its treatment are of paramount importance and are strongly associated with treatment default, which is related to treatment failure and microbial resistance to antibiotics. Hence adequate counseling is highly recommended. In addition, fostering social support (family and community) and adequate training of the health care providers to adopt a warm and respectful approach towards patients and their families are also important. Also, reducing the number of patients attending health units e.g by increasing number of treatment centers may help reduce TB treatment default.

Conflict of Interests

The authors have not declared any conflict of interests.

ACKNOWLEDGMENTS

Authors would like to thank our colleagues at MOH Khartoum State and TB control programme. We are further grateful to all TB coordinators and health care workers at TB units for their cooperation.

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