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Patients Characteristics Associated with Tuberculosis Treatment Default: A case control study in high incidence are in western Kenya

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Abstract

Background: Poor adherence to treatment is a common occurrence and is associated with patients remaining infectious for longer periods, relapse, treatment failure and the emergence of multidrug resistant or extreme drug resistant TB. This problem is further compounded by TB-Human Immunodeficiency virus (HIV) co-infection putting a further burden on the drug burden that TB patients are taking. Our objective was to identify risk factors associated with tuberculosis (TB) treatment default in western Kenya.

Methods: We conducted retrospective case control study design utilizing both primary and secondary data to identify factors associated with treatment default using data from a cohort of patients (adults and children) registered during the period January 2012 and March 2014 in Rachuonyo North Sub-County Homabay County. The secondary data was abstracted from TB register while primary data was collected using a standardized patient questionnaire. We defined default as interrupting TB treatment for two or more consecutive months during treatment. Cases were a sample of registered TB patients receiving treatment under DOTS that defaulted from treatment. Controls were those who began therapy and were cured, completed or failed treatment. We use bivariate logistic regression analysis to identify independent risk factors associated with default.

Results: We enrolled a total of 297 of cases and controls (135 cases and 162 controls). The main reasons for defaulting included distance from health facility, relocation, stigma, longer time waiting and side effects of anti TB drugs, ignorance, drug shortage and feeling better. The risk factor for default included paying service charge (OR, 2.93; 95%CI 1.24-6.94), residing 6 Km from the health facility (OR, 5.06; 95%CI 2.05-12.49), staff having negative attitude (OR, 4.42; 95%CI 2.07-9.42), perception that staff in health facility were not skilled (OR, 2.97; 95%CI 1.52-5.77), health facility not well equipped (OR, 2.76; 95%CI 1.36-5.59), lack patient Support

Structure (OR, 3.05; 95%CI 1.62-5.75) and lack of patient recognition (OR, 13.36; 95%CI 4.47-39.98).. Further analysis revealed that those who had not disclosed their TB status (OR, 2.90; 95%CI 1.27-6.60), those who were not getting household support (OR, 1.11; 95%CI 0.67-1.83) and those taking drugs and substances (OR, 2.37; 95%CI 1.37-4.20) were more likely to default from TB treatment.

Conclusions: Multiple factors including distance, staff having negative attitude, lack of patient support structure and recognition were independently associated with default. There is a need for integrated interventions that addressed patient and health facility related factors that lead to TB treatment default among patients

Background

Tuberculosis is a major global health problem second only to human immunodeficiency virus (HIV) in terms of mortality (WHO, 2011; WHO, 2012). Significantly TB is thought to infect a third of human population globally and by 2010 it was estimated that there were 12 million TB cases (WHO, 2012). This was further compounded by the fact that a majority of the cases present with HIV infection (Tola et al., 2015) and the brunt of these infections are borne by African countries (WHO, 2011). Indeed studies have indicated that a country like Kenya which is ranked 13th among the 22 countries with highest TB burden globally also have the highest HIV burden (MOH, 2007; Muture et al., 2011). Although treatment of TB requires long time medication regimen (Freiden et al., 2004; Lackey et al., 2015), evidence indicates that taking anti-tuberculosis drugs for at least six months can successfully treat TB (Muture et al., 2011; Hailu et al., 2015). This led the Kenyan Ministry of Health (MOH) to adopt the recommended World Health Organization (WHO) TB control strategies and treatment regimens (Muture et al., 2011). The TB treatment regimens takes 6 months and involves intensive phase that takes place within the first two months following initiation of treatment where patients collects drugs on weekly basis and the continuation phase were they collect drugs on fortnight basis (WHO, 2008; Muture et al., 2011). During the intensive phase the TB patients mainly take a combination dose of rifampicin (R), isoniazid (H), pyrazinamide (Z) and ethambutol (E) followed by four months of rifampicin and isoniazid (Muture et al., 2011; Tola et al., 2015). However, treatment of multi-drug resistant TB (MDR-TB) treatment regimen takes more than six months (Lackey et al., 2015). Overall the long period of medication has been associated with default or low adherence to TB treatment regimes resulting in drug resistance, continued transmission in communities, mortality and impact on health system costs (Toczek et al., 2012; Hailu et al., 2015).

To ensure long term adherence to treatment several countries have adopted Direct Observed Therapy short course (DOT) strategy by a health worker or a close relationship during the treatment period (Muture et al., 2011; Lackey et al., 2015). However, despite the implementation of these policies and programs, treatment failures have been reported in many Africa countries (Muture et al., 2011;Tola et al., 2015) as a result of non-adherence and loss to follow up (Hailfu et al., 2015). In deed reports indicate that treatment success rate in Kenya is still below the WHO recommended rates and this has further been compounded by HIV co-infection (MOH, 2010). Although there is geographical variation of TB prevalence in Kenya (MOH, 2007; Muture et al., 2011), there is still a paucity of data on treatment default in counties with the highest HIV and TB co-infections like Homa Bay county (NASCOP, 2014;Yuen et al., 2014). Therefore, this study was designed to determine the prevalence of TB treatment default among TB patients in

regions with high TB and HIV prevalence

Default from TB treatment encompasses both non-adherence and lost to follow up (Tola et al., 2015). Whereas non-adherence to treatment refers to the patients inability, erratic, refusal or selective compliance in taking TB medications prescribed by health workers (Reichman and Lardizabal, 2013;WHO, 2013), lost to follow up refers to where TB patients do not start treatment or where the treatment is interrupted for 2 consecutive months or more (WHO, 2013). A previous study in Nairobi County found that the rate of TB treatment defaulters was higher during the intensive phase of treatment and decreased with each subsequent month (Muture et al., 2011). This is similar to findings from Brazil and Hong Kong (Chang-Yeung et al., 2003; Oliveira et al., 2006). However, other studies from Sub-Saharan Africa, and Singapore found that the rate of default is more during the continuation phase (Chee et al., 2000; Daniel et al., 2006). These data indicate that there are context-specific issues influencing the rate of default and the treatment phase where default occurs. More importantly, HIV-co-morbidity has been found to influence TB treatment default (Tola et al., 2015).

The risk of default from TB treatment is a multifactorial process influenced by individual patient behavioral factors, health facility related factors, sociodemographic and economic factors, community related factors, therapy-related factors, knowledge-related factors (Muture et al., 2011; WHO, 2013; Tola et al., 2015). Of significance is that these factors are inter-related and form a network of causal pathways against TB patient tolerance ability to TB treatment (Hargreaves et al., 2011). Hence there is a need for a thorough understanding of how these factors influence TB patients' tolerance ability and promote treatment non-adherence and lost to follow up. This will be critical in developing strategies and interventions to improve treatment outcomes in TB patients. In deed previous studies in Sub-Saharan Africa indicated that socioeconomic factors such as financial constraints are a major impediment to adherence to TB treatment (Tola et al., 2015). The other determinants include lack of social support or stigma especially for those co-infected with HIV, low education (Dodor et al., 2005). Yet other studies have also found that older age, being male, inadequate knowledge, and ignorance on need for treatment compliance, consumption of alcohol and cigarette smoking are also import determinants of default from TB treatment (Muture et al., 2011; WHO, 2013; Tola et al., 2015)). In addition, lack of food, HIV status of the TB patients, distance from health facilities, poor service provider attitudes, negative attitude by TB patients towards the treatment centers, drug stock outs, poor access to health services and living near to treatment centre, patients resorting to traditional medication or herbal medicine (Bagchi et al., 2010; Muture et al., 2011; Tola et al., 2015). The side effects of the drugs or where the patients feel better after initial treatment are important determinants of non-adherence and loss to follow up (Wasonga,2006; Tachfouti et al., 2012). Although these previous studies indicate that these factors are important determinants in influencing treatment default, there is a paucity of data on factors that influence treatment outcomes in regions with both high TB and HIV burden in western Kenya. Our primary objectives was to describe the frequency of treatment default in a high incidence region of Rachuonyo-North sub-county and to identify factors associated with treatment default in order to provide insight to the policy makers and clinicians in improving care. We therefore, conducted a case control study in the Sub-County, looking for determinants of treatment default.

Methods

Study design

We performed a retrospective case control study design utilizing both primary and secondary data.

Study population

The study population comprised the cohort of patients (adults and children) registered during the period January 2012 and March 2014 distributed in all health districts in Rachuonyo North Sub-County Homabay County. The epidemiological data of all TB patients was abstracted from TB registers from all TB control program treatment sites in Rachuonyo North Sub-County, namely; Kendu Sub-County Hospital, Miriu Health Centers, Kandiege Health Centers, Olando Disp., Wagwe Health Centers, Simbi Dispensary, Chuowe Dispensary, Kobuya Dispensary, Chuthber Dispensary, Kosele Dispensary, Nyaoga Dispensary, Homalime Dispensary, Lela Dispensary and Alum Beach Dispensary. The Sub-County has a population of approximately 141,037 residents who are predominantly of Luo ethnicity and practice farming as the major economic activity. The HIV prevalence in this area stands at 26.8% (NASCOP, 2014).In addition recent data indicate that TB prevalence in western Kenya where RachuonyoSub-County is located is 32.1% (Videlis *et al.,* 2015). This region also has high poverty levels standing at 45%(MOH, 2008; 2012).The TB control program registers and gives medication to all TB patients in the sub county health facilities including those with HIV co-infection. The ministry of health as also integrated TB and HIV services since the year 2005 in the whole country (Sitienei *et al.,* 2013). Cases were patients whose treatment were interrupted for 2 consecutive months or more (as defined by WHO) or did not start treatment while controls will be those who adhere to treatment regimes.

Sampling procedure

From the sampled facilities, all patients who defaulted within the study period will be enrolled. Controls will be randomly selected from among the patients who had completed treatment course. Cases and controls will be matched for site (approximately equal number of each per treatment site). To enhance understanding of risk factors for default, a sample of 335 cases and 335 controls aged 15 years and above (adults) will be randomly selected from the target study population from which 335 cases and all 335 controls will be traced and interviewed.

Study procedure

Statistical analysis

Data collected was checked on the field and cleaned at the end of each day to ensure completeness, consistency, credibility and eligibility. This was done to correct errors or to fill-in missing information before another day of data collection. The study participants were stratified into cases and controls and analysis was carried out for both secondary and primary data. Anthropometric data was analyzed using Epi Info for Windows, Version 3.3.2 while STATA 13 statistical software (Stata corp., College Station, TX, USA) packages were used for data analysis. An association was analyzed using two-tailed Yates-corrected chi-square or Fisher exact test. Odds ratios were used as measure of association and corresponding 95% confidence intervals calculated using Taylor (T) series. Variables significant at the two-tailed 0.2 levels during univariate analysis were included in multivariate logistic regression model to determine the factors that influence default. Kaplan-Meier survival analysis method was used to determine probabilities of defaulters continuing with thetreatment program over different durations

Ethical considerations

This was a retrospective study and did not involve any experimental procedures on the patients. This study was approved by the Ethical Review Board of University of East Africa, Baraton

(UEAB/02/11/2015). All the study participants provided written informed consent and received a copy of the form. Data was managed securely and anonymously. Names and address of the patients of the patients were only collected for the purpose of follow up.

Results

Characteristics of the study population

As shown in table 1, a total of 297 of cases and controls (135 cases and 162 controls) were enrolled. Among the cases there were 71 males and 89 were young adults aged between 20-40 years. Most of the cases (65) had secondary education and 44 had 4-6 people in their households. Of the 135 cases, 49 used bicycle as a means of transport to the health facilities, 115 had disclosed their TB status and 89 were getting household support. In addition 46 were taking drugs and substances and 98 had under five year old children in their households.

Table1 Sociodemographic characteristics of the study population

Characteristics	Cases (n = 135) N(%)	Controls (n = 162) N(%)	Total n(%)	Chi square	p - value
Sex					
Male	71(45.4)	91(56.2)	162(54.6)	0.3807	0.537
Female	64(47.4)	71(52.6)	135(45.4)		
Age Group					
Adolescent(<20 Years)	7(77.8)	2(22.2)	9(3.0)	4.9172	0.178
Young Adults (20-40)	89(42.8)	119(57.2)	208(69.8)		
Middle-Age Adults(41-59Years)	29(50)	29(50)	58(19.5)		
Elderly (<59 Years)	11(47.8)	12(52.2)	23(7.7)		
Highest level of education					
None	2(66.7)	1(33.3)	3(1.0)	2.4847	0.478
Primary	59(41.3)	84(58.7)	143(48.0)		
Secondary	65(49.2)	67(50.8)	132(44.3)		
Tertiary	10(50)	10(50)	20(6.7)		
No. of people in household					
1 - 3 People	40(39.2)	62(60.8)	102(40.3)	11.7258	0.003
4-6 people	44(47.3)	49(52.7)	93(36.8)		
Above 6 people	39(67.2)	19(32.8)	58(22.9)		
Mode of transport					
On foot	44	60	104	5.8008	0.122
Bicycles	49	48	97		
Motocycles	30	47	77		
vehicles	13	7	20		
Disclosure of patient TB status					
Yes	115	150	256	6.8817	0.009
No	20	9	29		
Household support					

Yes	89(45.18%)	108(45.82%)	197(69.12	0.1592	0.69
No	42(47.73%)	46(52.27%)	88(30.88%)		
Taking drugs or substances					
Yes	46	27	73	9.832	0.002
No	89	124	213		
No. of under five year old in households					
underfive year old	98(44.95%)	120(55.05%)	218	3.0305	0.692

All the data was analyzed using Pearson Chi-square

Reasons for defaulting

To enhance reasons for defaulting, all the 135 cases who had defaulted were interviewed. Data obtained from the interviews were used to identify the main reasons for defaulting. As shown in figure 1, of 135 cases interviewed distance was cited to have the highest effect leading to TB default 25.61% followed by relocation 23.17%, stigma 10.98%, longer time waiting and side effects had similar contribution at 9.76%, ignorance 6.1%, drug shortage and facility factors had equal effects at 4.88% while those who felt better at 3.66% and lastly inadequate food had the least effect at 1.22%

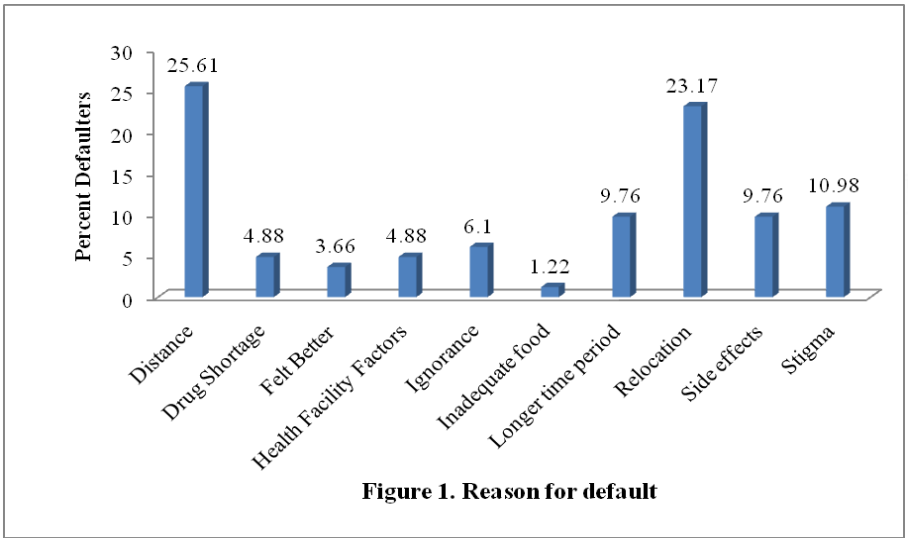

Figure 1. Reason for default

Risk factors for default

Sociodemographic related factors

Univariate analysis was carried out to find the sociodemographic risk factors associated with TB default. As shown in table 2, univariate analysis shows that male (OR, 0.92; 95% CI 0.544-1.572), young adults (OR, 0.19; 95%CI 0.021 - 1.679), middle age adults (OR, 0.28; 95%CI 0.029 - 2.728) and elderly (OR, 0.21; 95%CI 0.020 - 2.174) were less likely to default from TB treatment. Those with secondary (OR, 1.51; 95%CI 0.881 - 2.597) and tertiary (OR, 1.17; 95%CI 0.394 - 3.450) education were more likely to default relative to those with primary education.

The mode of transports to health facility was an important determinant with those using bicycles (OR, 1.39; 95%CI 0.80-2.43) and vehicles (OR, 2.53; 95%CI 2.53) relative to those who went on foot. Moreover, those who considered distance to health facility as a challenge (OR, 3.67; 95%CI 2.44-6.00) and those who paid for transport (OR, 1.64; 95%CI 1.01-2.66) relative to those who did not considered distance as a challenge and those who did not pay for transport respectively. Those with 4-6 people (OR, 1.37; 95%CI 0.76- 2.46) and above 6 people (OR, 3.19; 95%CI 1.58 - 6.42) in their households were more likely to default relative to those with 1-3 people in their households. Further analysis revealed that those who had not disclosed their TB status (OR, 2.90; 95%CI 1.27-6.60), those who were not getting household support (OR, 1.11; 95%CI 0.67-1.83) and those taking drugs and substances (OR, 2.37; 95%CI 1.37-4.20) were more likely to default from TB treatment.

Characteristics	**Cases (n = 135)**	**Controls (n = 162)**			
	N(%)	**N(%)**	**Total n(%)**	**OR**	**p - value**
Sex					
Male	71(45.4)	91(56.2)	162(54.6)	0.92(0.544-1.572)	0.773
Female	64(47.4)	71(52.6)	135(45.4)	ref	
Age Group					
Adolescent(<20 Years)	7(77.8)	2(22.2)	9(3.0)	ref	
Young Adults (20-40)	89(42.8)	119(57.2)	208(69.8)	0.19(0.021 - 1.679)	0.134
Middle-Age Adults(41-59Years)	29(50)	29(50)	58(19.5)	0.28(0.029 - 2.728)	0.275
Elderly (>59 Years)	11(47.8)	12(52.2)	23(7.7)	0.21(0.020 - 2.174)	0.189
Highest level of education					
None	2(66.7)	1(33.3)	3(1.0)	-	-
Primary	59(41.3)	84(58.7)	143(48.0)	ref	
Secondary	65(49.2)	67(50.8)	132(44.3)	1.51(0.881 - 2.597)	0.134
Tertiary	10(50)	10(50)	20(6.7)	1.17(0.394 - 3.450)	0.781
No. of people in household					
1 - 3 People	40(39.2)	62(60.8)	102(40.3)	ref	
4-6 people	44(47.3)	49(52.7)	93(36.8)	1.37(0.762 - 2.459)	0.293
Above 6 people	39(67.2)	19(32.8)	58(22.9)	3.19(1.582 - 6.422)	0.001
Mode of transport					
On foot	44	60		ref	

Bicycles	48	48		1.39(0.80-2.43)	0.244
Motocycles	13	47		0.87(0.48-1.59)	0.651
vehicles	30	7		2.53(0.93-6.87)	0.068
Is distance a challenge					
Yes	97	64		3.67(2.44-6.00)	0.0001
No	38	92		ref	
Paid for Transport					
Yes	92	93		1.64(1.01-2.66)	0.045
No	41	68		ref	
Disclosure of patient TB status					
Yes	115	150		ref	
No	20	9		2.90(1.27-6.60)	0.011
Household support					
Yes	89(45.18%)	108(45.82%)		ref	
No	42(47.73%)	46(52.27%)		1.11(0.67-1.83)	0.69
Taking drugs or substances					
Yes	46	27		2.37(1.37-4.20)	0.002
No	89	124		ref	

Health care and system-related factors

As shown in table 3, univariate analysis showed that those who paid for the service charge (OR, 2.93; 95%CI 1.24-6.94) were more likely to default relative to those who did not pay. Relative to those who resided <1Km from health facility, those from 1-6 Km (OR, 3.10; 95%CI 1.63-5.93) and those from more than 6 Km (OR, 5.06; 95%CI 2.05-12.49) were more likely to default on treatment. Analysis also revealed health staff attitude was an import determinant of default with those who agreed that staff had negative attitude (OR, 4.42; 95%CI 2.07-9.42) were more likely to default relative to those who disagreed. Further analysis revealed that those who agreed that staff in health facility were not skilled (OR, 2.97; 95%CI 1.52-5.77), health facility not well equipped (OR, 2.76; 95%CI 1.36-5.59), lack patient Support Structure (OR, 3.05; 95%CI 1.62-5.75) and lack of patient recognition(OR, 13.36; 95%CI 4.47-39.98) were more likely to default from treatment.

Characteristics	Cases (n = 135)	Controls (n = 162)			p - value
	N(%)	N(%)	Total n(%)	OR	
Waiting time at the facility					
Less than 30min	56(30.4)	128(69.6)	184(62.0)	0.15(0.0754 - 0.2958)	0.000
30min-1hr	41(74.6)	14(25.4)	55(18.5)	ref	
More than 1hr	39(67.2)	19(32.8)	58(19.5)	0.70(0.3094 - 1.5879)	0.394
Schedule for TB treatment					
Once Every week	102(44.7)	126(55.3)	228(78.9)	0.69(0.3900 - 1.2112)	0.194
Once Every Two Weeks	33(54.1)	28(45.9)	61(21.1)	ref	
Treatment Return date					
After one week	59(36.2)	104(63.8)	163(59.9)	0.24(0.1310 - 0.4580)	0.000
After fortnight	44(69.8)	19(30.2)	63(23.2)	ref	
After one month	16(66.7)	8(33.3)	24(8.8)	0.86(0.3162 - 2.3591)	0.775
I don't know	9(40.9)	13(59.1)	22(8.1)	0.30(0.1093 - 0.8174)	0.019
Frequency of taking drugs					
Once	124(45.3)	150(54.7)	274(94.2)	0.58(0.2140 - 1.5647)	0.281
More than Once	10(58.8)	7(41.2)	17(5.8)	ref	
Defaulting consequences					
Cured	7(87.5)	1(12.5)	8(5.3)	ref	
Dead	17(65.4)	9(34.6)	26(17.3)	0.27(0.0286 - 2.5491)	0.253
Resistance	49(67.1)	24(32.9)	73(48.7)	0.29(0.0339 - 2.5075)	0.262
Transmission to others	12(80.0)	3(20.0)	15(10.0)	0.57(0.0494 - 6.6062)	0.654

Others	7(25.0)	21(75.0)	28(18.7)	0.05(0.0050 - 0.4578)	0.008
Paid service charge					
Yes	19(70.4)	8(29.6)	27(9.5)	2.93(1.2386 - 6.9432)	0.014
No	115(44.7)	142(55.3)	257(90.5)	ref	
Distance of health facility					
<1Km	15	47		ref	
1-6 Km	96	97		3.10(1.63-5.93)	0.001
>6 Km	21	13		5.06(2.05-12.49)	0.0001
Staff have negative attitude					
Disagree	99	141		ref	
agree	31	12		4.42(2.07-9.42)	0.0001
Don't know	5	5		1.14(0.30-4.35)	0.849
Staff not skilled					
Disagree	100	139		ref	
agree	32	15		2.97(1.52-5.77)	0.001
Don't know	3	4		1.04(0.29-4.76)	0.957
Health facility not well equipped					
Disagree	46	58		ref	
agree	35	16		2.76(1.36-5.59)	0.005
Don't know				6.30(0.71-55.86)	0.098
Lack Patient Support Structure					
Disagree	95	137			

agree	37	17	3.05(1.62-5.75)	0.001
Don't know	3	5	0.58(0.11-3.04)	0.516
Staff Lack patient recognition				
Disagree	65	139	ref	
agree	25	4	13.36(4.47-39.98)	0.0001
Don't know	5	5	2.14(0.60-7.65)	0.242

Discussion

This study was carried out to identify the reasons and determinants default in a region with high HIV prevalence of western Kenya. We found that there are multiplicity of reasons for defaulting including distance from health facility, relocation, stigma, side effects of the drugs, period of treatment, ignorance, health facility factors and drug shortage suggesting that there context-specific issues influencing the rate of default and the treatment phase. This findings are in agreement with previous studies from Kenya (Muture et al., 2011), suggesting that although the Kenya, the government supports treatment of tuberculosis by availing free diagnostic services, drugs and direct observed therapy, there is a need of community targeted interventions to address these issues to ensure up-scaling of uptake of TB treatment in poor resource settings.

Previous studies have shown that within the settings of the settings were directly observed therapy has been implemented; there are several factors that lead to default from TB treatment default (Hascker et al., 2008; Muture et al., 2011; Culqui et al., 2012; Lackey et al., 2015). Contrary to previous studies that indicated that TB treatment default is associated with male gender (Muture et al., 2011; Lackey et al., 2015; Kigonzi et al., 2017), we found that males were less likely to default from TB treatment. Although the reasons for difference between our findings and the previous studies are not clear, it has been shown that in areas with high HIV-TB co-infection, male gender is protective against death in TB patients (Kigonzi et al., 2017). This has been attributed to gender-based barriers including financial dependence, lower general literacy and household stigma (Krishnan et al., 2014). In line with research conducted in Morocco and Northwest Ethiopia (Tessema et al., 2009; Cherkaoui et al., 2014) it was observed that younger older cases (<24 years) were more likely to default treatment compared to their older counterparts (≥20 years) and this is probably due to the fact that older patients do not face barriers such as financial dependence and stigma that may led to default or that they had superior strategies to help them cope with TB than their younger counterparts. Together, these data indicate that there is a need of programmatic intervention that target younger patients. Furthermore transport cost associated weekly collection of drugs from health facility can lead to

TB cases defaulting especially in households with limited resources (Muture et al., 2014). In line with this previous observation, our study reveals that TB patients who indicated that transport is a challenge or paid for transport were more likely default from TB treatment, indicating that there is need of programs that address issues of resources for transport and other opportunity costs to make the drugs easily available to TB patients. In poor resource settings such as our study area, patients have to choose between competing priorities like buying food for family members and paying for transport to get medication. It significant to note that our data also revealed that TB cases from households with ≤3 people were less likely to default compared to those with >4 people further suggesting that financial and opportunity cost are a major challenge to TB treatment and needs to be addressed in order to reduce the rate of default to TB treatment.

This study showed that TB patients who had not disclosed their status were more likely to default from TB treatment. This can be attributed to the fact that in African societies TB patients are stigmatized due cultural factor associated with misinformation about the medical aspects of the disease and misinformation that TB is related to HIV (Muture et al., 2011; Kigonzi et al., 2017), this can influence patient health seeking behavior in terms of weekly collection of drugs since in areas with high HIV burden the patients are thought to be on antiretroviral drugs. This led the Kenyan Ministry of Health to integrate TB and HIV care where both the National tuberculosis control program (NTP) and the National AIDS and Sexually Transmitted Diseases (STD) Control Program (NASCOP) screen TB or HIV patients for both disease to enable early initiation to treatment and care (Lönnroth et al., 2010; Muture et al., 2011). Further our data reveal that TB cases that did not get household support were more likely to default and this can be attributed to household stigma (Krishnan et al., 2014). These data indicate that in order to reduce treatment default among TB patients there is need of advocacy programs against stigmatization directed at the community and at household levels to reduce stigma associated with TB. Several studies have shown that drug and alcohol use are associated with a higher risk of default (Culqui et al., 2011; Lackey et al., 2015; Kigonzi et al., 2017; Ramachandran et al., 2017). Consistent with these previous findings this study found that TB cases that were using drugs or substances were more likely to default. This is partly due to the fact that drug or substance use may lead to patients forgetting or failing to take drugs leading to default. More importantly, these drugs and substances can be cheaply obtained in poor resource setting and their combined effects with anti-tuberculosis drugs can liver damage(Muture et al., 2011). These exacerbated side effects can lead to TB treatment default. Of significance, behavior change intervention targeting reduction of patient alcohol has proven to be effective (Kaner et al., 2007).

With respect to health facility related factors associated with TB treatment default. our data indicates that waiting time at the facility before provision of services, patient knowledge about TB treatment schedule or return data and frequency of taking drugs, paying for service charges, distance to health facility, health provider negative attitude, lack of patient recognition, perception that staff are not well trained and the hospitals are not well equipped were important determinants of TB treatment default. This is in agreement with previous observation that Health system related factors such as service provider or patient attitudes, drug stock outs and access to health facility are important determinants of adherence or default to TB treatment (Daniel et al., 2006; Muture et al., 2011). Indeed it has been shown that health system barriers that impact on

TB treatment adherence including lack of adequate financing of health care programs and overstretched or overworked healthcare workers is a common phenomenon in poor resource countries like Kenya (Muture et al., 2011). However, these health facility factors can be mitigated through enhanced training of health care workers on communication and counseling, development of effective and patient centered materials that focus on adherence and self-monitoring, enhanced clinical follow up and surveillance of TB cases, provision of incentives like transport reimbursements, improved community participation in provision of based DOTS, integration of HIV and TB treatment and care, enhanced and efficient of TB programs and (adequate financial and human resources (Finlay et al., 2012). In addition, there is need to reduce waiting time, equip health facility and ensure that there are no drugs stock of TB drugs.

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Conclusions

The main reasons for defaulting including distance from health facility, relocation, stigma, side effects of the drugs, period of treatment, ignorance, health facility factors and drug shortage suggesting that their context-specific issues influencing the rate of default and the treatment phase. In addition, being of younger age, taking substance or drugs, distance from the hospital, health workers attitude, lack of patient support structure was determinant of default.

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Declarations

Ethical Consideration

The study was approved by the ethical review board of University of East Africa Baraton (REC: UEAB/17/02/2016). All the study participants parents and legal guardians gave their written

Competing interest

The authors declare they have no competing interests.

Authors' contributions

KF, JOA and ASA conceived of the study and participated in its design; KF and AO carried out laboratory assays; ASA carried out statistical analysis. KF and AJO drafted the manuscript. All authors read and approved the final manuscript

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