Reasons for Interruption, Knowledge, Attitude and Practices of Patients Treated for Tuberculosis in Nandi County, Kenya

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***Abstract*-**

Introduction

Kenya is ranked 15th on the list of 22 high-TB burden countries as determined by the World Health Organization, with a case notification rate of 440 cases per 100 000 persons. National TB treatment success rate is 85.5%, Nandi County lags behind at 77%. The country has adopted WHO recommended short course since 2007 and direct observation of treatment (DOT) since 1993 to mitigate against interruption of treatment. We conducted this study to determine the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence interruption in Nandi County.

Methods

We randomly selected and interviewed 252 subjects using a pretested semi structured questionnaire. Data on social and demographic factors, lifestyle, clinical information, family support, nutritional status, medication history was collected. Analysis was conducted with Epi- Info Version 7.Outcome variable was treatment interruption. Analysis was by logistic regression at 95% CI and $P<0.05$ significance level.

Results

We interviewed 252 respondents of whom 149 (59.1%) were males. The most common age 69 (27.4%) was 30-39 years. The most frequently given reason 50 (64.1%) for treatment interruption was "Too many pills". Not knowing the risk of interrupting TB treatment AOR 2.8 (1.43 – 5.62), ever ashamed because one had TB AOR 2.6 (1.33 – 4.93) and ever used herbal medicine during treatment AOR 2.1 (1.04 – 4.22) were independently associated with treatment interruption.

Conclusion

Treatment interruption was associated with lack of knowledge on the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment. These can be addressed by intensive pre-treatment counselling of patients and care givers that focuses on the importance of adhering to treatment and reduction of stigma as well as sensitizing herbalists and traditional medicine men on TB and engaging them in TB patient referral.

Index Terms- Interruption, Kenya, Knowledge, Practices, Tuberculosis, Nandi

I. INTRODUCTION

Tuberculosis is a chronic infectious disease caused by *Mycobacterium tuberculosis*, a fastidious intracellular alcohol-acid fast bacterium. Currently two billion people in the world live with TB (1). Nine million people a year contract the airborne bug while 1.4 million die from it (2). This translates to a person being infected with TB every second (3). It is the most common cause of mortality among HIV positive patients, with 25% of HIV/AIDS fatalities actually die from TB (4),(5). In 2012, 8.6 million people fell ill with TB and 1.3 million died from TB (5). Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top three causes of death for women aged 15 to 44 (5). In 2012, an estimated 530 000 children became ill with TB and 74 000 HIV-negative children died of TB (6).

Africa holds approximately 30% of world TB burden (3) (7), with 363 persons per 100,000 population being newly infected with TB. TB mortality in Africa is at 74 deaths per 100,000 of population (8).Of the twenty-two countries designated as high TB burden by the World Health Organization, nine are in Africa (Democratic Republic of Congo, Ethiopia, Kenya, Mozambique, Nigeria, South Africa, Tanzania, Uganda, and Zimbabwe) (7).

In Kenya, national TB treatment success rate is 85.5% (9), Nandi county lags behind at 77% (10). The case detection rate is 85% (11). WHO estimate show that the country currently has 3024 multi drug resistant (MDR) TB patients; this has justified the need of a surveillance system to monitor MDR TB (1).In 2010, Nyanza, Rift valley province and Nairobi all contribute 56% of the total TB burden in Kenya (12).

Successful treatment of TB involves taking treatment for at least 6 months. Kenya has adopted WHO recommended short course since 2007.This involves 2 months of intensive phase and 4 months of continuation phase. Treatment interruption is one of the major obstacles to TB control. Poor adherence means patients remain infectious for longer and are more likely to relapse or succumb to TB. To improve compliance to treatment, emphasis is placed on direct observation of treatment (DOT) by a health worker or a close family member. Despite use of this WHO recommended strategy since 1993, Kenya is still among the 22 high TB burden countries in the world.

Treatment interruption appears to be significantly linked to transportation time, the sex of the patient, patient information and the quality of communication between patients and health workers (13). In a study in 2011 in Nigeria, Ibrahim *et al* showed that interruption of treatment was associated with living more than 5km from the patients' treatment Centre (13).This study established distance, cigarette smoking and lack of knowledge of treatment duration of TB as independent predictors. This is also supported by O'Boyle *et al* (14) in Malaysia and Kandel *et al* (15) in South Africa. They reported long distance, costs of travel and travel time as predictors of interruption of treatment among TB patients. Association of TB and smoking is also documented in a study in Hong Kong (16).

Patient knowledge, attitude and practice are also important determinants of interruption. The disappearance of symptoms is an indication of clinical improvement from diseases and a measure of the effectiveness of therapy. Because of the high quality drugs used in the DOTS strategy it is common place for TB symptoms to disappear within a few weeks of treatment (17). Patients with inadequate knowledge of the duration of the treatment may feel that they are cured and thus stop the treatment. Kaona *et al* (2004) in his study on assessment of factors contributing to TB treatment adherence in Ndola, Zambia found that feeling well was the major reason for patient stopping treatment.

The attitude of the health care worker towards the patient remains an important factor that can keep the patients on treatment or make them interrupt. Unfriendly attitude might make patients feel threatened and unwelcomed leading to treatment interruption. Negative effect of poor attitude of health care workers on TB treatment was reported by Jaiswal *et al*. They noted that patient who defaulted from treatment blamed the health workers for their unpleasant behavior and attitude towards them, whom they described as rude and unhelpful (18).

Cultural and religious practices also influence on patient health seeking behavior including adherence to TB treatment in many developing countries. Studies from Africa, Bangladesh and Syria showed that most married women must seek permission from their husband to attend health care services including TB treatment (19) (20). Despites this barrier women tend to adhere to anti-TB treatment leading to better treatment outcome than men indicating that there could be hidden factor among the female. However, Ibrahim *et al*., (2014) found no significant relationship between age and gender and interruption of TB treatment.

Tuberculosis, like HIV/AIDS, is often associated with stigmatization and thus may create resistance among patients to treatment. A study carried out in Nigeria (21), raised an important point of delays in care seeking behavior due to stigma experienced by TB patients. Studies have shown that stigmatization creates self-denial among those with diseases like TB and Sexually Transmitted Infections (STIs); hence most of them fail to comply with the treatment (22).

Despite these multiplicity of determinants of treatment interruption, we believe the easily modifiable factors are the ones we should focus on. This is why we chose to determine the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence treatment interruption. Since Nandi County has a treatment success rate below the national target, we choose to conduct the study in this county in order to use the findings to improve the TB indicators.

II. METHODS

Study Site

The study was conducted in Nandi County, Kenya. The county borders Uasin-Gishu county, Kericho county, Vihiga county, Kisumu county and Kakamega county. It comprises 5 administrative sub-counties; Nandi central, Nandi North, Nandi South ,Nandi East and Tinderet (23).It covers a total area of 2884.2 square kilometers with temperatures ranging from 120 to 260 c and rainfall between 1200mm and 2000mm per annum (24).The county population is 752965 people, with density of 261 persons/Km2.The population is distributed across age groups as follows; 0-14 (45%), 15-64(51.4%) and above 65(3.6%).Of the population, 47.4% live below the poverty line. Agriculture is the main economic activity .Nandi County has a total of 138 health facilities, infant mortality ratio of 66 per 1000 newborns and an under five year's mortality rate of 111 per 1000 live births. The main diseases affecting residents in the county are Malaria, respiratory tract infections, diarrhea diseases and skin diseases.

Study design

We conducted a cross sectional study between April and June 2015.

Study population

Our study population was patients who had been initiated on treatment for TB between January 1st, 2013 and June 30th, 2014.

Sample size determination

We determined minimum subjects to be sampled with a consideration of 95 % confidence interval, a power of 80 %, Zα of 1.96 and a precision of 0.05.In 2009, E.J Carter estimated prevalence of treatment interruption at 19%.Patients initiated on treatment in Nandi

county between 1st January, 2013 and 30th June 2014 was 843.Using Cochrane formula (1977) we obtained a minimum sample of 236 which we adjusted to 260 after a 10% adjustment for non-response.

Sampling Procedure

We used simple random sampling .A list of all the patients initiated on treatment for TB from January 1st, 2013 to June 30th, 2014 in Nandi County was obtained from the county TB register. Using a computer, we generated 260 random numbers between 1 and 843.The patients alongside these numbers were selected and enrolled in the study for interview. Refusals were replaced with the next consecutive numbers up to three consecutive replacements for each refusal. Beyond three consecutive refusals for a single slot, then a new computer generated number was generated.

Eligibility and exclusion criteria

We included patients in the county TB register aged 14 years and above, who had been initiated on treatment between January 1st 2013 and 30th June 2014 and gave assent and/consent. The participants in the study included new TB cases, re-treatments, smear positive, smear negative, defaulters and non-defaulters, those with known or unknown HIV status. At the time the study was conducted, the patients were expected to have completed treatment if they had observed their prescription without missing their pills.

We excluded those aged 13 years and below since they would not give objective opinions. Those patients who did not give consent were also exclude as were those transferred out of the county after initiation of treatment. We also excluded those who died after initiation of treatment to avoid interviewing proxies since this would introduce bias.

Case definitions

We used the following case definitions:

- A TB patient was defined as a person who had been diagnosed with TB based on clinical, microscopic or X-ray examination within Nandi County and initiated on treatment between January 1, 2013 and June 30, 2014.
- Treatment interruption was defined as failure to adhere to prescribed TB medication for a period of two consecutive weeks or more by persons who were already on TB treatment, regardless of their return to therapy or DOTs afterwards.

Data collection

The sampling frame was obtained from the county TB register for the year 2013/2014.This was downloaded into Microsoft Excel sheet. The randomly selected subjects were interviewed by directly administered pretested questionnaires by trained data collectors. The data collectors comprised mainly the TB ambassadors who are employed by partners implementing TB activities in the county. They are provided with motorbikes and bicycles which they use to do home visits. They used these means to trace subjects and conduct interviews at their homes. Those patients not found were still traced with their telephone contacts available in the TB registers. The questionnaires were both in English and the local languages (Nandi, Luhya and Luo).

This method enables the interviewers to clarify and elaborate the purpose of the research and effectively convince the respondents about the importance of the study. We collected information on socio-demographics, clinical presentation, side effects, reasons for interruption if any, patient knowledge on TB, attitudes and practices. We used the clinic registration number as the unique identifier during data collection. The questionnaires were reviewed daily and stored in lockable cabinets.

Data analysis

Data from questionnaires were then transferred into Epi- Info Version 7(CDC, USA Atlanta) make view by two sets of data clerks to minimize errors. The resulting two sets of database were cleaned and validated using check codes and queries, comparisons being made between the sets. In case of discrepancies, reference was made to the original copy of questionnaire.

Univariate analysis using frequency and proportions. Variables that are continuous were summarized using means and standard deviation while discrete variables were summarized using median, range and inter-quartile ranges. Bivariate analysis was done to establish determinants of treatment interruption using prevalence odds ratio as a measure of association, where 95% confidence intervals were used with Yates corrected chi-square test of significance where factors with p-values of ≤ 0.05 were considered as significant. The outcome variable was treatment interruption. The independent contribution of each significant factor was assessed using unconditional logistic regression where factors with a p-value of ≤ 0.15 were considered. This also controlled for multiple confounding. Stepwise forward elimination method was used to select the variables in the final model.

Ethical approval and considerations

A consent form explaining the rationale and benefits of the study was used to seek informed consent from potential participants. Participants between 14 years and 17 years of age assented to the study and consent was obtained from their guardians. Participation in the study was voluntary and participants were at liberty to withdraw from the study at any stage without being penalized. No study participant was identified by names in any report from the study. The study had minimal risks. Permission was obtained from Nandi county health department. Clearance was also obtained from Jaramogi Odinga Oginga Teaching and referral hospital (JOOTRH) ethical review board prior to data collection (ERC.2/VOL.1 (103)).

III. RESULTS

Socio-demographic of TB patients

We interviewed 252 respondents of whom 149 (59.1%) were males. The most common age 69 (27.4%) was 30-39 years. The mean age was 40.0 ± (15.3 years), median age was 37.5 years (IQR 28.5 – 48.0) while mode was 30.0 years. One hundred and forty-three

(56.8%) were married while the rest were in other types of relationships. Monogamy was reported among 206 (81.8%). Most 152 (60.3%) had attained primary education while the rest had post-primary education (Table 1).

Symptoms, Side effect profile and reasons for interruption of TB treatment

A total of 220 (87.3%) presented with cough at diagnosis while the rest did not. Night sweat 173 (68.7%) was the second commonest symptom followed by chest pains 172 (68.3%).The most frequently given reason 50 (64.1%) for treatment interruption was "Too many pills". Other reason given included side effects 41 (52.6%), Inadequate food 40 (51.3%) and Unpleasant medication 37 (47.4%).None of those interviewed indicated having interrupted treatment due to drug stock outs. The most 119(47.2%) reported side effect was change in urine colour. One hundred and eighty-two (72.2%) reported that TB is caused by an infectious agent, the rest either gave a wrong response or did not know the cause of TB (Table 2).

Predictors of treatment interruption based on knowledge and practice of patient

Sharing utensils with others in the community during treatment OR 0.5(0.31 – 0.86), Ever ashamed because of having TB 3.3 (1.87 – 5.74), Ever experiencing being neglected because of TB OR 1.9 (1.08 – 3.19), Use of herbs during treatment OR 2.6 (1.36 – 5.01), Lack of knowledge on TB transmission OR 2.0 (1.13 – 3.47) and Lack of knowledge on risk of treatment interruption OR 4.1 (2.15 – 7.76) were found to be statistically significant on bivariate analysis. Sex and age were not statistically significant (Table 3).

On Logistic regression, not knowing the risk of interrupting TB treatment AOR 2.8 (1.43 – 5.62), ever ashamed because one had TB AOR 2.6 (1.33 – 4.93) and ever used herbal medicine during treatment AOR 2.1 (1.04 – 4.22) were independently associated with treatment interruption (Table 4).

IV. DISCUSSION

We determined the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence treatment interruption in Nandi County. We found that one in every three patients initiated on treatment for TB would interrupt. The major factors associated with treatment interruption were not knowing the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment.

Similar findings on interruption rates are also documented by Ibrahim et al, 2011 (13) who found one in every five patient in Plateau state in Nigeria to have interrupted. In South Africa, Kandel et al, 2008(15) found interruption rates of 47% in a similar setting. This high rate could be attributed to the increasing TB burden due to HIV/AIDS pandemic (25) (26) against a low health workforce. This has made pre-treatment counseling to be insufficient and of poor quality since health workers are overburdened. Insufficiency of counseling as a contributor to high interruption rates has also been advanced by Muture et al., (2011) (17).Inadequate pre-counselling would subsequently lead to poor patient practices that make patients vulnerable to failing to take their pills.

Use of herbal medicine during treatment increased the risk of interrupting treatment twofold. Similar findings have been documented by Muture et al., 2011) (17) who found that use of herbal medication was associated with a six fold increase in risk of interruption (AOR 5.70).Boateng et al., 2010 also found that defaulters were more likely to receive other health care (Spiritualists and traditional healers) more than non-defaulters (OR 2.96) in a study in Ghana. Like most rural settings in Africa, traditional medicine men and herbalists exist in Nandi County. They are in constant competition with conventional medical practitioners, in some areas, especially so where the level of education is low. In such areas, it is easy for the herbalist to convince patients since they believe in witchcraft. Use of herbal medicine as an alternative showed lack of confidence in the use of prescribed anti-TB drugs as well as inadequate information. This meant they could easily abandon treatment in favour of the herbal medicine. Since the efficacy of the herbal medication is not assured, this leads to continued infectivity and thus increased TB burden. Use of herbal medicines is also associated with liver and kidney damage. Since anti-TB drugs are also associated with liver damage, their concurrent use with herbal medicines would make increase the damage, leading to excercebation of the unpleasant side effect. Side effects discourage patients from taking their pills.

Apart from use of herbal medication, stigma was found to significantly influence interruption. Being ashamed because one had TB was associated with three times risk of interrupting treatment. Similar findings were reported in a study in Madagascar (27) about patients who "felt that TB was a shameful disease" who had three times the risk of defaulting treatment compared to those who did not (OR 2.97). Stigma associated with TB and HIV/AIDS acts as a barrier to adherence since patients are not free to disclose their condition. They hide from family members and thus end up not getting the desired support. This ultimately ends up in non-adherence. A study in South Africa assessing effect of attitude and knowledge on TB treatment initiation and adherence concluded that stigma influenced TB patients' decisions in health seeking behavior and adherence (28).

We also found that knowledge on TB was an important predictor of interruption. Patients who did not have knowledge on the dangers of interruption were three times (AOR 2.8) more likely to interrupt as compared to those who did. Several studies have documented the role of knowledge on TB in determining interruption (29) (30) (31).Boateng et al., (2010) established that knowledge on how people get TB, whether TB is curable and knowledge on symptoms of TB were important determinants of TB interruption. The drugs used in the first two months of treatment are highly effective and thus kill most of the bacteria on initiation of treatment (32) (33) (34). The reduction of the bacteria load leads to resolution of symptoms making the patients feel better. This explains why most patients would default early in the course of therapy. This is due to inadequate knowledge on TB leading to interruption of treatment. . Kaona et al in their study on assessment of factors contributing to TB treatment adherence in Ndola, Zambia showed that feeling well was the major reason for patient stopping treatment (35). Their finding is similar with our results which revealed that lack of knowledge of duration of treatment was significantly associated with interruption of treatment.

Our study findings should be interpreted in consideration of some limitations. The study excluded patients treated for TB aged 13 years and below. This accounts for 11% of all TB patients (36).This may affect generalization of the study on the entire population. The study was also prone to interviewer bias since the TB ambassadors (interviewers) are also involved in patient care. We reduced this bias by intensive training of data collectors.

V. CONCLUSION

This study has shown that treatment interruption in Nandi County is high. This was attributed to poor pre-treatment counselling leading to inadequate knowledge of TB and poor patient practices. It was also deduced that the most important factors associated with treatment interruption were lack of knowledge on the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment. We suggest that these factors be addressed to reduce treatment interruption by intensive pre-treatment counselling of patients and care givers that focuses on the importance of adhering to treatment and reduction of stigma. Herbalists and traditional medicine men should be sensitized on TB and engaged in TB patient referral.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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COMPETING INTEREST

We wish to state that there was no conflict of interest in this study.

REFERENCES

[1] van't Hoog AH, Laserson KF, Githui WA, Meme HK, Agaya JA, Odeny LO, et al. High prevalence of pulmonary tuberculosis and inadequate case finding in rural western Kenya. Am J Respir Crit Care Med. 2011 May;183(9):1245–53.

[2] Sharecare. How many people in the world have tuberculosis (TB)? - Tuberculosis (TB) - Sharecare. 2013.

[3] World Health Sciences. Tuberculosis World Wide Statistics and Infection Rates. 2013.

[4] Nathan F. World Tuberculosis Day 2013: The second biggest global killer; Independent Health Blogs. web page. 2013

[5] WHO. WHO's 2013 global report on tuberculosis: successes, ... - PubMed - NCBI. Lancet. 2013;

[6] Chaisson RE, Martinson NA. Tuberculosis in Africa — Combating an HIV-Driven Crisis. N Engl J Med. 2008;358(11):1089–92.

[7] Zumla A, George A, Sharma V, Herbert RHN, Oxley A, Oliver M. The WHO 2014 global tuberculosis report--further to go. Lancet Glob Heal. 2015 Jan;3(1):e10–2.

[8] TB CARE I - Kenya.

[9] MOH Kenya. DLTLD Annual report 2012. Government of Kenya; 2013.

[10] Sitienei J, Nyambati V, Borus P. The Epidemiology of Smear Positive Tuberculosis in Three TB/HIV High Burden Provinces of Kenya. Epidemiol Res Int. 2013 Oct ;2013:e417038.

[11] Ibrahim LM, Hadejia IS, Nguku P, Dankoli R, Waziri NE, Akhimien MO, et al. Factors associated with interruption of treatment among pulmonary tuberculosis patients in Plateau State, Nigeria, 2011. Pan Afr Med J . 2014 ;17.

[12] OBoyle S. J, Power J. J, Ibrahim M. Y, Watson J. P. Factors affecting patient compliance with anti-tuberculosis chemotherapy using the directly observed treatment, short-course strategy (DOTS). Int J Tuberc Lung Dis. 2002 Apr;6(4):307–12.

[13] Kandel TR, Mfenyana K, Chandia J, Yogeswaran P. The Prevalence and Reasons for Interruption of Antituberculosis Treatment by Patients at Mbekweni Health Centre in King Sabata Dalidyebo (KSD) District in the Eastern Cape Province. South African Fam Pract. 2008 ;50(6):47–47.

[14] Leung CC, Yew WW, Chan CK, Tam CM, Lam CW, Chang KC, et al. Smoking and tuberculosis in Hong Kong. Int J Tuberc Lung Dis Off J Int Union Against Tuberc Lung Dis. 2003 Oct;7(10):980–6.

[15] Muture BN, Keraka MN, Kimuu PK, Kabiru EW, Ombeka VO, Oguya F. Factors associated with default from treatment among tuberculosis patients in nairobi province, Kenya: A case control study. BMC Public Health. 2011 Sep ;11(1):696.

[16] Jaiswal A, Singh V, Ogden JA, Porter JDH, Sharma PP, Sarin R, et al. Adherence to tuberculosis treatment: lessons from the urban setting of Delhi, India. Trop Med Int Heal. 2003 Jul;8(7):625–33.

[17] Karim F, Ahmed F, Begum I, Johansson E, Diwan VK. Female-male differences at various clinical steps of tuberculosis management in rural Bangladesh. Int J Tuberc Lung Dis Off J Int Union Against Tuberc Lung Dis. 2008 Nov;12(11):1336–9.

[18] Begum V, de Colombani P, Das Gupta S, Salim AH, Hussain H, Pietroni M, et al. Tuberculosis and patient gender in Bangladesh: sex differences in diagnosis and treatment outcome. Int J Tuberc Lung Dis Off J Int Union Against Tuberc Lung Dis. 2001 Jul;5(7):604–10.

[19] Karim F, Islam MA, Chowdhury AMR, Johansson E, Diwan VK. Gender differences in delays in diagnosis and treatment of tuberculosis. Health Policy Plan. 2007 Sep;22(5):329–34.

[20] Odusanya OO, Babafemi JO. Patterns of delays amongst pulmonary tuberculosis patients in Lagos, Nigeria. BMC Public Health. 2004 May;4(1):18.

[21] Yimer S, Holm-Hansen C, Yimaldu T, Bjune G. Health care seeking among pulmonary tuberculosis suspects and patients in rural Ethiopia: a community-based study. BMC Public Health. 2009 Dec;9(1):454.

[22] Transparent Africa. Open Kenya | Transparent Africa . 2014.

[23] Nandi County Facts and Details - Kenya Counties Leaders Updates .

[24] Van't Hoog AH, Marston BJ, Ayisi JG, Agaya J a, Muhenje O, Odeny LO, et al. Risk factors for inadequate TB case finding in Rural Western Kenya: a comparison of actively and passively identified TB patients. PLoS One. 2013;8(4):e61162.

[25] Comolet TM, Rakotomalala R, Rajaonarioa H. Factors determining compliance with tuberculosis treatment in an urban environment, Tamatave, Madagascar. Int J Tuberc Lung Dis. 1998 Nov;2(11):891–7.

[26] Cramm JM, Finkenflügel HJM, Møller V, Nieboer AP. TB treatment initiation and adherence in a South African community influenced more by perceptions than by knowledge of tuberculosis. BMC Public Health. BioMed Central Ltd; 2010 Jan 17;10(1):72.

[27] Boateng SA, Kodama T, Tachibana T, Hyoi N. Factors Contributing to Tuberculosis (TB) Defaulter Rate in New Juaben Municipality in the Eastern Region of Ghana. J Natl Inst Public Heal. National Institute of Public Health; 2010 Sep;59:291–7.

[28] Muture BN, Keraka MN, Kimuu PK, Kabiru EW, Ombeka VO, Oguya F. Factors associated with default from treatment among tuberculosis patients in nairobi province, Kenya: A case control study. BMC Public Health . 2011 Sep;11(1):696.

[29] Pardeshi GS. Time of default in tuberculosis patients on directly observed treatment. J Glob Infect Dis .Medknow Publications; 2010 Sep;2(3):226–30.

[30] Liu Z, Shilkret KL, Ellis HM. Predictors of Sputum Culture Conversion Among Patients With Tuberculosis in the Era of Tuberculosis Resurgence. Arch Intern Med. 1999 May;159(10):1110.

[31] Kaona FA, Tuba M, Siziya S, Sikaona L. An assessment of factors contributing to treatment adherence and knowledge of TB transmission among patients on TB treatment. BMC Public Health. 2004 Dec;4(1):68.

[32] WHO. Tuberculosis . 2014 .

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Table 1; Socio-demographics of patients on treatment for TB, Nandi County, 2014

Description	Total (%)	Interrupters (%)	Non-interrupters (%)
Total subjects	252(100)	78(31.0)	174(69.0)
Sex			
Female	103(40.9)	33(42.3)	70(40.2)
Male	149(59.1)	45(57.7)	104(59.8)
Age			
14-19	10(4.0)	1(1.3)	9(5.2)
20-29	59(23.4)	13(16.7)	46(26.4)
30-39	69(27.4)	26(33.3)	43(24.7)
40-49	55(21.8)	18(23.1)	37(21.4)
50-59	29(11.5)	6(7.7)	23(13.2)
Over 60	30(11.9)	14(18.0)	16(9.2)
Marital status			
Cohabiting	3(1.2)	1(1.3)	2(1.2)
Married	143(56.8)	46(59.0)	97(55.8)
Other	3(1.2)	1(1.3)	2(1.2)
Single	86(34.1)	23(29.5)	63(36.2)
Widow/ Widower	17(6.7)	7(9.0)	10(5.8)
Type of family			
Monogamous	206(81.8)	61(78.2)	145(83.3)
Polygamous	46(18.2)	17(21.8)	29(16.7)
Education level			
Primary and below	152(60.3)	53(68.0)	99(56.9)
Secondary	72(28.6)	19(24.4)	53(30.5)
College/Tertiary	23(9.1)	6(7.7)	17(9.8)
University	5(2.0)	00	5(2.9)
Religion			
Atheist	7(2.8)	2(2.6)	5(2.9)
Catholic	113(44.8)	39(50.0)	74(42.5)
Muslim	1(0.4)	0	1(0.6)
Protestant	131(52.0)	37(47.4)	94(54.0)
Occupation			
Casual laborer	53(21.0)	19(24.36)	34(19.54)
Employed(Formal)	27(10.7)	8(10.26)	19(10.92)
Farmer	118(46.8)	34(43.59)	84(48.28)
Other	11(4.4)	2(2.56)	9(5.17)
Small scale business	43(17.1)	15(19.23)	28(16.09)
Nuclear family type			
Dual parent	148(58.7)	33(42.3)	115(66.1)
Single parent	104(41.3)	45(57.7)	59(33.9)

Table 2; Symptoms at diagnosis, Side effect profile and reasons for interruption among patients on Treatment for TB, Nandi County, 2014

Variable	Total (%)	Interrupters (%)	Non-interrupters (%)
Symptoms at diagnosis			
Cough	220(87.3)	69(88.5)	151(86.8)
Chest pains	172(68.3)	55(70.5)	117(67.2)
Hemoptysis	49(19.4)	15(19.2)	34(19.5)
Weight loss	156(61.9)	61(60.4)	95(62.9)
Loss of appetite	85(33.7)	23(29.5)	62(35.6)
Night sweats	173(68.7)	50(64.1)	123(70.7)
Other symptoms	7(2.9)	1(1.3)	6(3.5)
Reasons for interruption			
Too ill		10(12.82)	
Stock-outs		0	
Migration to new home		2(2.6)	
Afraid of Injections		2(2.6)	
Inadequate food		40(51.3)	
Medication tasted unpleasantly		37(47.4)	
Drugs not working		12(15.4)	
Too many Pills		50(64.1)	
Relief from symptoms		13(16.7)	
Stigma		12(15.4)	
Side effects		41(52.6)	
Side effects of anti-TBs			
Altered vision	26(10.3)	10(12.8)	16(9.2)
Headaches	46(18.3)	14(18.0)	32(18.4)
Vomiting	74(29.4)	30(38.5)	44(25.3)
Itching	57(22.6)	21(26.9)	36(20.7)
Jaundice	25(9.9)	11(14.1)	14(8.1)
Abdominal pains	54(21.4)	22(28.2)	32(18.4)
Change in urine colour	119(47.2)	45(57.7)	74(42.5)
Causes of TB			
Act of God	11(4.4)	3(3.9)	8(4.6)
Don't Know	29(11.5)	12(15.4)	17(9.8)
Infectious agent	182(72.2)	49(62.8)	133(76.4)
Other causes	11(4.4)	8(10.3)	3(1.7)
Smoking	15(6.0)	5(6.4)	10(5.8)
Witchcraft	4(1.6)	1(1.3)	3(1.7)

Table 3; Predictors of interruption of Treatment for TB, Nandi County, 2014

Variable	Interrupters (%)	Non-interrupters (%)	OR CI (P Value)
Sex			
Female	33(42.31)	70(40.23)	1.1(0.63-1.87)
Male	45(57.69)	104(59.77)	P=0.86
Age			
Below 40 years	40(41.28)	98(56.32)	0.82(0.48-1.40)
Above 40 years	38(48.72)	76(43.68)	P=0.54
Card available during interview			
Yes	45(57.69)	113(64.94)	0.74(0.43-1.27)
No	33(42.31)	61(35.06)	P=0.34
Patients shared utensils with others during treatment.			
Yes	43(42.6)	89(58.9)	0.52(0.31-0.86)
No	58(57.4)	62(41.1)	**P=0.02**
Ever ashamed because of having TB			
Yes	52(66.7)	66(37.9)	3.27(1.87-5.74)
No	26(33.3)	108(62.1)	**P<0.001**
Ever experienced being neglected because of TB			
Yes	46(58.9)	76(43.7)	1.85(1.08-3.19)
No	32(41.1)	98(56.3)	**P=0.04**
Used herbs during treatment Yes	23(29.5)	24(13.8)	2.61(1.36-5.01)
No	55(70.5)	150(86.2)	**P=0.01**
Know transmission of TB			
No	33(42.3)	47(27.0)	1.98(1.13-3.47)
Yes	45(57.7)	127(73.0)	**0.02**
Lack knowledge on risk of interruption.			
Yes	29(37.2)	21(12.1)	4.09(2.15-7.76)
No	49(62.8)	152(87.9)	**P<0.001**
Patients Know the cause of TB			
No	16(24.6)	28(17.4)	1.55(0.77-3.11)
Yes	49(75.4)	133(82.6)	P= 0.29

Table 4; Multi-Variate analysis of factor associated with TB Treatment interruption, Nandi County 2013-2014.

Term	Odds Ratio	95% C.I	P-Value
Having knowledge on TB transmission	0.6	0.35-1.20	0.170
Not knowing risks of interrupting treatment	2.8	1.43-5.62	**0.003**
Did share utensils with others during treatment	0.9	0.47-1.55	0.598
Ever ashamed because one had TB	2.6	1.33-4.93	**0.005**
Ever neglected because one had TB.	1.1	0.58-2.12	0.760
Ever used herbal medicine during treatment.	2.1	1.04-4.22	**0.040**