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The impact of Co-morbidity and Treatment Characteristics on Adherence to Tuberculosis Treatment in Kisumu East Subcounty, Kenya

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Abstract: *Despite the great strides made in TB diagnosis and highly effective shorter periods of treatment, there are still poor treatment outcomes in a significant proportion of the patients. Poor adherence to TB treatment is one of the leading causes of poor outcomes of treatment. Kisumu East Subcounty in Kenya records some of the highest adverse outcomes of care. Therefore a cross sectional descriptive study was conducted in the Subcounty to establish the impact of co-morbidity and treatment characteristics on TB treatment adherence among tuberculosis patients above 18 years attending TB clinics in Kisumu East Subcounty. The data was analyzed using SPSS version 21. Descriptive statistics, bivariate analysis and binary logistic regression were used in the analysis and data presented in contingency tables and figures. Significance was assumed at P value ≤0.05. Belief that TB treatment affects other treatments; (OR: 0.03; 95% CI:5. 0-0.1 ;P<0.001), retreatment (OR: 11; 95% CI: 4.2-29.6 ;P<0.001), not completing previous treatments (OR:19; 95% CI:6-73 ;P<0.001) self discontinuation (OR:0.1; 95% CI: 0.01-1 ;P<0.049) were significant in predicting adherence. These aspects can serve as a guide for flagging some patient as having potential for non-adherence thus appropriate follow-up measures instituted in time. It is important to establish the effects of socio-demographic aspects on adherence in every TB care setting for appropriate follow-up.*

Key words: *Tuberculosis, adherence, co-morbidity, treatment characteristics*

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I. Background

Most studies on TB treatment outcomes have attributed high prevalence of TB treatment adverse outcomes to non-adherence to treatment schedule and regimens (Dolma et al., 2013; Dooley et al., 2011; Kritski et al., 1997). The study region sees some of the highest cases of poor outcomes of treatment like loss to care, TB related deaths and drug resistance. These treatment outcomes can be linked to non adherence to TB treatment (DLTLD, 2010; Gondi & Malika, 2010). From clinical interviews of some of the TB clients seeking treatment at Kisumu District Hospital by the researcher, the patients individually reported great challenges in complying with treatment requirements due to several reasons.

Co-morbidity of TB with other diseases is major concern when it comes to treatment modalities. It has been shown that co-morbidity with diabetes, HIV/AIDS and mental illnesses raise concerns beyond drug interaction. These co-morbidities have negative effects on adherence to TB medications (Adane, Alene, Koye, & Zeleke, 2013; Gebremariam, Bjune, & Frich, 2010; Sardar et al., 2009). Amplification of drug toxicity in patients on TB/HIV treatment is a factor in determining compliance (Gray & Cohn, 2013).

II. Methodology

This was a cross sectional descriptive study that was conducted to establish the impact of co-morbidity and treatment characteristics on TB treatment adherence among tuberculosis patients above 18 years attending TB clinics in Kisumu East Subcounty. The sample size was calculated using Taro Yamane formula ($n = N / [1+Ne^2]$) (Yamane, 1967) from target population of 523 TB patients with a sampling error (e) of 0.05. Two hundred and fifty respondents were sampled. Proportionate samples were allocated to the high volume TB clinics in the region and later a sampling frame derived from the TB permanent registers. Survey participants were selected using random numbers. An interviewer administered structured questionnaire was used to collect data from the respondents on the survey aspects pertaining TB care. The data was analyzed using descriptive

statistics and bivariate analysis to determine the co-morbidity and treatment aspects that significantly determined treatment adherence. Significance was assumed at P value ≤0.05.

III. Results

A total of 250 TB patients were sampled and their data was available for analysis. The mean age of the respondents was 32.5±10.9 with over 90% being below the age of 50. About 60% of the respondents were males. Only 13.2% were from rural areas with the remaining being from urban, periurban and informal settlements. Over 60% of the sampled population was married and those with basic education and above being more than 90%. Twenty four percent of these respondents were unemployed and about 60% of the population either earned less than 5000Ksh per month or didn't know how much their monthly income was. Ninety point four percent of the respondents were adherent to their TB treatment regimen.

Co-morbidity

This table portrays other diseases that the patient had apart from TB, whether they were on treatment for the same or not and their perceived effects of TB treatment on the other treatments. Only the attribute of thinking that TB treatment affects the other concomitant treatments for co-morbidity was significant (OR:0.03; 95% CI:0-0.1; P<0.001).

Table 1. Distribution of Co-morbidity Aspects

Characteristic			Drug Adherence		Bivariate Analysis		
			Yes n(%)	No n(%)	OR	95% CI	P Value
Concurrent morbidities and their Treatment	Other Disease	Yes	132 (88)	18 (12)	0.5	0.2 - 1.2	0.115
		No	94 (94)	6 (6)			
	HIV Positive	Yes	109 (87.2)	16 (12.8)	0.5	0.2 - 1.1	0.086
		No	117 (93.6)	8 (6.4)			
	On Rx for the other Condition	Yes	131 (86.2)	21 (13.8)	1.2	1.1 - 1.2	0.489
		No	3 (100)	0(0)			
	TB Rx Affects the other Treatments	Yes	13 (44.8)	16 (55.2)	0.03	0 - 0.1	**<0.001**
		No	118 (95.9)	5 (4.1)			
How TB Treatment Affects other Treatment	Makes other Drugs Less Effective	Yes	2 (33.3)	4 (66.3)	0.4	0.1 - 2.2	0.258
		No	17 (58.6)	12 (41.4)			
	Lead to Many Pills	Yes	10 (52.6)	9 (47.4)	0.9	0.2 - 3.3	0.83
		No	9 (56.3)	7 (43.7)			
	More Side Effects	Yes	7 (63.6)	4 (36.4)	1.8	0.4 - 7.6	0.452
		No	12 (50)	12 (50)			

Numbers in brackets are proportions. Significance was determined by Pearson Chi-square analysis. Values in bold are statistically significant at $P \leq 0.05$. All the *P* values are 2 sided.

Treatment characteristics

Table shows the distribution of previous treatment aspects such as having had previous treatments(OR:11.1; 95% CI:4.2-29.6; P<0.001), completion of previous treatments(OR:18.5 ; 95% CI:4.6-73.6; P<0.001) and self discontinuation from previous treatments (OR:0.13 ; 95% CI:0.01-1.2; P<0.049). These aspect demonstrated significance in determining adherence. Other previous treatment characteristics did not display significance in predicting adherence.

Table 2. Previous treatment characteristics

Characteristic			Drug Adherence		Bivariate Analysis		
			Yes n(%)	No n(%)	OR	95% CI	P Value
Previous Treatment	Previous Treatment	Yes	48 (72.7)	18 (27.3)	11	4.2 - 29.6	**<0.001**
		No	178 (96.7)	6 (3.3)			
	Complete Prev. Treatment	Yes	48 (94.1)	3 (5.9)	19	4.6 - 73.6	**<0.001**
		No	13 (46.4)	15 (53.6)			
Reason Patient Didn't Complete Previous Treatment	Side Effects	Yes	0 (0)	3 (100)	0.5	0.3 - 0.7	0.088
		No	13 (52)	12 (48)			
	Taking Too Long	Yes	1 (33.3)	2 (66.7)	0.5	0.04 - 6.8	0.63
		No	12 (48)	13 (52)			
	Bored With Drugs	Yes	2 (50)	2 (50)	1.2	0.14 - 9.8	0.877
		No	11 (45.8)	13 (54.2)			
	Self Discontinue	Yes	1 (14.3)	6 (85.7)	0.1	0.01 - 1.2	**0.049**
		No	12 (57.1)	9 (42.9)			
	Felt Better	Yes	2 (66.7)	1 (33.3)	2.6	0.2 - 31.9	0.457
		No	11 (44)	14 (56)			
	Too Many Drugs	Yes	3 (50)	3 (50)	1.2	0.2 - 7.3	0.843
		No	10 (45.5)	12 (54.5)			

Numbers in brackets are proportions. Significance was determined by Pearson Chi-square analysis. Values in bold are statistically significant at $P \leq 0.05$. All the *P* values are 2 sided.

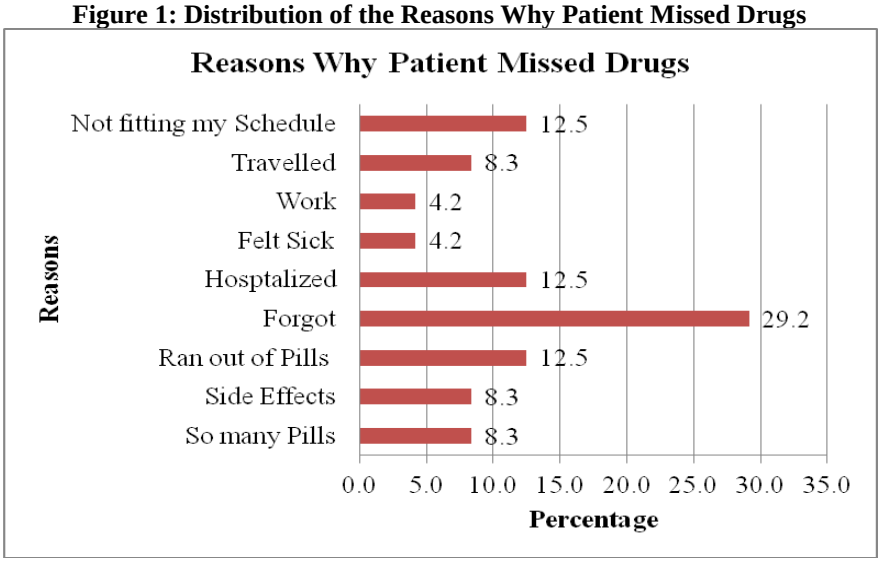
Current treatment element of missing drugs over the weekend (OR:0.29; 95% CI:0.1-1; P=0.021;) and clinic compliance (OR:22.3; 95% CI:6.4-77.6; P<0.001) demonstrated relationship with adherence. Other previous treatment characteristics did not display significance in predicting adherence; period on treatment

Table 3: Current Treatment Aspects

Characteristics		Drug Adherence		Bivariate Analysis		
		Yes	No	OR	95% CI	P Value
Treatment Period (Months)	< 2	61 (88.4)	8 (11.6)	0.74	0.3-1.8	0.509
	> 2	165 (91.2)	16 (8.8)			
Missed Meds on Weekends	Yes	16 (76.2)	5 (23.8)	**0.29**	**0.1-1.0**	**0.021**
	No	210 (91.7)	19 (8.3)			
Clinic Compliance	Yes	172 (98.3)	3 (1.7)	**22.3**	**6.4-77.6**	**<0.001**
	No	54 (72)	21 (28)			

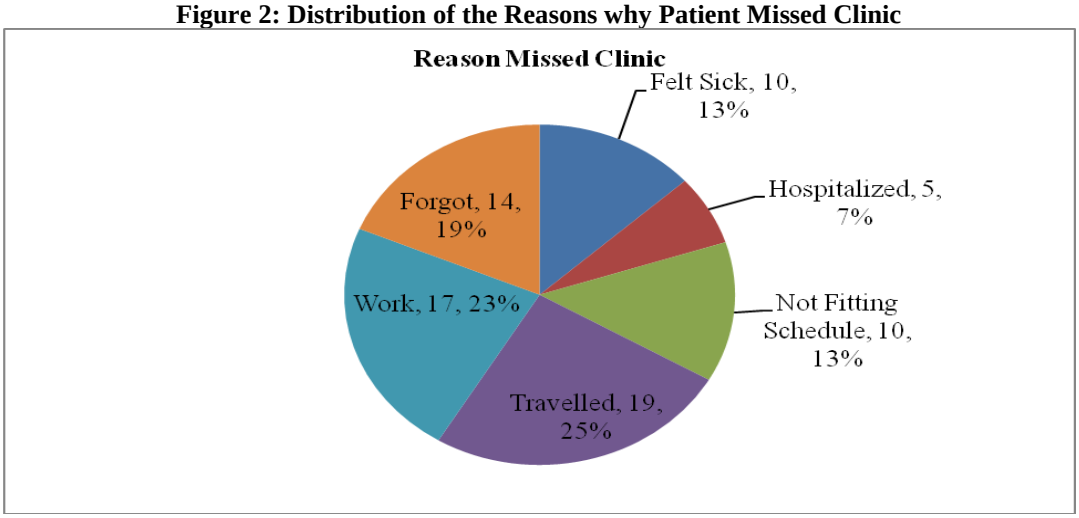
Numbers in brackets are proportions. Significance was determined by Pearson Chi-square analysis. Values in bold are statistically significant at $P \leq 0.05$. All the *P* values are 2 sided.

Figure 1: Distribution of the Reasons Why Patient Missed Drugs



The most predominant reason for missing medication was forgetting 29.2%. Being hospitalised, running out of pills and dose time not fitting in the schedule all 12.5 percent were the second principal reasons for missing drugs on weekends.

Figure 2: Distribution of the Reasons why Patient Missed Clinic



As per the figure on reasons why patients missed clinic days (figure 2), the primary reason for missing clinic was travelling (25%) followed by work (23%) and forgetting (19%) respectively.

IV. Discussion

Co-morbidity

Under this subcategory there was only one stratifying factor was significantly associated adherence albeit a negative association. Those who were on treatment and thought that TB drugs affected the other concomitant treatments were less likely to be adherent to TB treatment (OR:0; 95%CI:0-0.1 ; P<0.001). The other factors analyzed in relation to adherence status were: any known co-morbidity (P=0.115); which condition it was (P=0.465) and whether or not on treatment for the said co-morbidity (P=0.489). These findings are contrary to many previous studies that showed significant relationship between co-morbidity and adherence (Adane et al., 2013; Awofeso, 2008; Naidoo et al., 2013; Ogundele, Moodley, Pillay, & Seebregts, 2016; Tola, Tol, Shojaeizadeh, & Garmaroudi, 2015). Adane et al., (2013) alluded to the fact that HIV/TB co-morbidity led to higher risk of non-adherence and Widjanarko et al., (2009) established that treatment side effects were augmented by TB/HIV simultaneous treatment which predicted non-adherence (Widjanarko, Gompelman, Dijkers, & van der Werf, 2009). Some of the established facts about co-morbidity being a predictor of adherence are: pill burden; drug side effects increase with concomitant treatment; and different clinic days. However, some studies established a unique enhancement of TB adherence in TB/HIV co-infection. This was attributed to the attention and adherence counseling that HIV positive patients got and the support groups that have been established to enhance adherence.

Treatment characteristics

A study in Nigeria established that previous treatments are a determinant of treatment failure. Patients who did not adhere to treatment previously were shown to be at high risk of not adhering to the current regimen(Alobu, Oshi, Oshi, & Ukwaja, 2014; Tesfahuneygn et al., 2015; Theron et al., 2015). In some studies more number of previous treatments affected adherence negatively (Peltzer & Pengpid, 2015). The WHO indicated that in Kenya 10% of newly reported cases of TB in Kenya were recurrent cases (W.H.O, 2014) and it is likely that most of these recurrences were due to the failure of patients adhere to their regimen (W.H.O, 2003). The current findings were in consensus with previous studies on previous treatment and adherence where first treatment (OR:11; 95%CI:4-29 ; P<0.001); completion of previous treatment (OR:18; 95%CI:5-73 ; P<0.001) and self discontinuation from previous treatment (OR:0.13; 95%CI:0.01-1.2; P=0.049) were significantly associated with adherence.

There was no demonstrable association between period on treatment (P=0.509) and adherence. This is contrary with previous findings in studies elsewhere (Adane, Alene, Koye, & Zeleke, 2013; Amuha, Kutyabami, Kitutu, Odoi-Adome, & Kalyango, 2009; Anyaike et al., 2013). It can be hypothesized that most of the patients in continuation phase have abated signs and symptoms thus slowly losing their perceived severity of the disease thus poor adherence to medication. Length of period of treatment is also a determinant adherence thus by the virtue that they have been on treatment for a longer period could explain the trend.

V. Conclusion and Recommendations

The belief that TB treatment affects other treatments, being a retreatment, prior history of not completing treatment and history of self discontinuation of treatment are key in determining adherence to current TB regimen. Special attention should be given to those on treatment in the continuation phase as most of the cases of treatment non adherence occurred in this period. The single speculation could be that in this period the disease signs and symptoms could be reducing i.e. the cough thus the patient starts feeling that they are cured from the disease thus stopping or not being adherent to the treatment.

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