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Determinants of non-Adherence among Tuberculosis Patients on Treatment at Mbagathi County Hospital, Nairobi, Kenya

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Tuberculosis is one of the leading causes of mortality globally. Non-adherence leads to development of drug resistance, treatment failure and relapse, increased transmission of the bacilli and prolonged morbidity and mortality. A cross-sectional study with a sample of 138 participants, selected by simple random sampling, interviewed using a structured questionnaire was implemented. Telephone interviews on patients who were identified as lost to follow up was conducted. Data was populated in an Excel sheet and analyzed descriptively and inferentially via logistic regression using Stata version 13 software. A total of 137 tuberculosis patients was enrolled, two thirds of whom were males, with a median age of 32 (IQR 25,42). The prevalence of non-adherence was 7.30% (n=10). Medication complexity (aOR 14.67, 95% CI 2.44-88.07, p =0.003) and forgetting to take medications (aOR 9.11, 95% CI 1.16-71.54, p =0.036) were the main determinants associated with non-adherence. Attention should be devoted to these factors by finding means to help patients remember to take their medications and adopting fixed dose combinations and pill organizers to reduce medication complexity.

Key words: Adherence, non-adherence, tuberculosis

INTRODUCTION

Approximately a quarter of the global population (1.7 billion people) have Tuberculosis (TB)[1]. With a projected 1.5 million succumbing to the disease in 2018, it is among the top causes of mortality worldwide. TB is a serious public health issue in Kenya [2]. Approximately 120,000 people develop TB and 18,600 people die from it in a year. It is responsible for about 6% of all deaths [3]. According to the World Health Organization (WHO), Kenya is among the 30 high-burden TB, TB/HIV, and multi drug resistant (MDR) TB nations in the world [4].

Adherence is "the extent to which a patient follows medical recommendations" [5]. According to studies, adherence among chronic illness patients in affluent nations averages 50% [5]. Poor adherence has a significant impact in poorer nations because of low health resources and access to health care [1]. Adherence to TB therapy is critical in reducing the emergence of drug-resistant strains and increases the chances of cure. Guidelines recommend counseling and assessment of psychological and emotional issues before initiating treatment and during follow-up visits to improve adherence [4].

Non-adherence during TB therapy is common, resulting in treatment failure and relapse, increasing morbidity, mortality and emergence of drug resistance [6]. WHO currently estimates 3,000 cases of MDR-TB in Kenya [2]. . Despite implementation of directly observed therapy (DOTS) in regions covered by WHO, TB patients are not completing their treatments [1]. This is due to non-adherence to therapy [6]. Poor adherence affects the course of the disease in a negative manner making the patients less receptive to therapy [5]. This cross-sectional study was designed and implemented to determine the extent of non-adherence to anti TB medication and the associated factors among Kenyan TB patients attending a public hospital.

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METHODS

Research Design and Location

A cross-sectional study design was employed where TB patients attending the TB clinic located at Mbagathi County Hospital (Nairobi County's primary infectious disease center) were interviewed using structured questionnaires.

Study Population

Patients on TB treatment at the Mbagathi County Hospital who met the inclusion criteria were enrolled. The inclusion criteria were that patients had to be: adults (18 years and above), with documented TB infection who were receiving treatment at the Mbagathi county hospital TB clinic and who were willing to participate in the study. Eligible patients who were excluded were: prisoners, pregnant women or those with a compromised mental status citing reduced autonomy and vulnerability.

Sample size, sampling technique and recruitment

The calculated sample size was 138 participants using the Cochran (1977) formula [7]. Simple random sampling was used to attain the sample size. Those who were chosen were taken through the consenting process by explaining what the study involved and only participated in the study voluntarily after signing the informed consent form.

Data analysis

Data was fed into an Excel spreadsheet and analyzed with Stata version 13 software (Release 13, StataCorp LLC, College Station, TX). A descriptive analysis was performed followed by logistic regression analysis (bivariable and multivariable) to determine the association between each categorical variable and non-adherence to anti-TB treatment.

Ethical considerations

Ethical approval was sought from the Kenyatta National Hospital and the University of Nairobi Ethics and Research Review Committee (Ref KNH-ERC /A/220). A research license was also obtained from NACOSTI (NACOSTI/P/23/27308). Participants were required to sign an informed consent form prior to taking part in the study.

RESULTS

Baseline characteristics of the participants

A summary of participants' baseline characteristics is shown in Table 1.

Table 1: Baseline characteristics of participants

Variable	n(%)
Sex	
Male	90 (65.69%)
Female	47 (34.31%)
Marital status	
Single	56 (40.88 %)
Married	66 (48.18 %)
Divorced	10 (7.30%)
Other	5 (3.65%)
Alcohol consumption	
Yes	13 (9.49%)
No	113 (82.48%)
Cigarette smoking	
Yes	13 (9.49%)
No	124 (90.51%)
Education status	
Primary	22 (16.06%)
Secondary	67 (48.91%)
Tertiary	48 (35.04%)
Occupation	
Unemployed	32 (23.23%)
Student	14 (10.22%)
Casual laborer	23 (16.79%)
Formally employed	42 (30.66%)
Self employed	26 (11.98%)
Monthly income level	
0-10000	65 (47.45%)
10,000-20000	43 (31.39%)
20000 -30000	22 (16.06%)
>30000	7 (5.11%)

Out of the 137 participants who agreed to participate in the study, 90 (65.69%) were males while 47 (34.31%) were females. The median age was 32 (IQR 25,42). Sixty-six participants (48.18 %) were married. Twenty-four (17.50%) participants had a history of drinking alcohol while thirteen (9.49%) reported smoking cigarettes.

Adherence status /level of the participants being treated for tuberculosis

Using the Morisky medication adherence scale (MMAS 8), majority of the participants had a medium level of adherence (66, 48.18 %) followed by high adherence (61, 44.52 %) and lastly low adherence level at (10, 7.30 %). The proportion of patients who were adherent was 92.70%.

Association between adherence status and factors associated with non-adherence

No associations were found between the adherence status of the participants with baseline characteristics, and social economic factors. There was a statistically significant association between the adherence status of the participants and perception of tuberculosis infection (p-value 0.012) and the complexity of the regimen (p-value 0.001 (Table 2) No other associations were identified. There was a significant association between the adherence status of the individual and the stress due to the illness or taking medications (p-value 0.030), forgetting to take medications (p-value 0.001), frequency of forgetting to take medications (p-value 0.001) and the motivation level of the participants (p-value 0.010) (Table 3).

Table 2: Association between therapy related factors and adherence status

Therapy related factors	Non adherent	Adherent	P value
Participants thoughts on Duration of Tb treatment			
Short	0	1	
Moderate	0	28	0.175[i]
Long	8	59	
Okay with duration	2	39	
Does duration affect medication taking behavior			
Yes	3	13	0.094[i]
No	7	114	
Complexity of TB regimen			
Yes	7	21	0.001[i]
No	3	106	
Availability of medication during visits			
Yes	8	100	
No	2	12	0.254[i]
Sometimes	0	15	
Experienced side effects due to medication			
Yes	5	67	1.000[i]
No	5	60	
Sought medical advice following side effects			
Yes	1	55	0.518[i]
No	3	72	

[i]Fishers exact test

Table 3: Association between patient- related factors and adherence status

Patient related factors	Non adherent	adherent	P value
Acceptance of illness status			
Yes	6	105	
No	1	7	0.127[i]
Cannot believe it	3	15	
Stress due to illness			
Yes	7	33	0.030[i]
No	3	85	
Not sure	0	8	
Forgetting to take medication			
Yes	3	9	
No	2	104	0.001[i]
Sometimes	5	14	
Frequency of forgetting to take medication			
All time	0	0	
Once in a while	6	15	0.001[i]
Rarely	4	112	
Fear of stigmatization due to Tb infection			
Yes	5	26	
No	4	94	0.051[i]
Sometimes	1	7	
Participants knowledge on Tuberculosis			
Very good	1	28	
Good	4	56	0.497[i]
Moderate	4	38	
Poor	1	5	
Participant's motivation to take their medication			
High	4	95	
Moderate	4	30	0.010[i]
Low	2	2	

Logistic regression analysis of determinants of non -adherence among tuberculosis patients

Only variables that had a statistically significant association with the adherence status at univariate level were included in the analysis (Table 4). At bivariable level, adherence status and regimen complexity were significantly associated (cOR=11.78, 95% CI 2.82,49.28, p-value 0.001). Participants who perceived the regimen as complex were 11.78 more times likely to be non-adherent compared to those who felt the regimen wasn't complex. In the multivariable analysis, this effect was strengthened and remained statistically significant (aOR= 14.67, 95% CI 2.44,88.07, p-value 0.003). Adherence status was significantly associated with forgetting to take medications at both bivariable and multivariable analysis. Participants who reported forgetting to take their medications were 9 times more likely to be non-adherent compared to those who did not forget to take their medications (aOR= 9.11, 95% CI 1.16,71.54, p-value 0.036). Participants who reported to sometimes forget to take their medications were 27 times more likely to be non -adherent as compared to those who never forgot to take their medications (aOR= 27.69, 95% CI 3.72,206.09, p-value 0.001).

Table 4: Bivariable and multivariable logistic regression of determinants of adherence among tuberculosis patients

Variable	cOR 95% CI	P value	aOR 95% CI	P value
Complexity of the Tb regimen				
No	Reference		Reference	
Yes	11.78 (2.82, 49.28)	0.001	14.67 (2.44,88.07)	0.003
Stressed about the illness or taking medications				
No	Reference			
Yes	3.46(0.77,15.70)	0.107		
Not sure	1			
Forgetting to take Tb medications				
No	Reference		Reference	
Yes	17.33 ((2.56,117.57)	0.003	9.11 (1.16,71.54)	0.036
Sometimes	18.57 (3.29, 104.98)	0.001	27.69 (3.72,206.09)	0.001
Frequency of forgetting to take medications				
Rarely	Reference			
All the time	2.97(0.26,33.63)	0.379		
Once in while	-			
Patients' motivation when it comes to taking Tb medications				
High	Reference			
Moderate	2.94 (0.43, 20.18)	0.273		
Low	018.93(0.12,3034.91)	0.256		

DISCUSSION

In this cross-sectional study looking at adherence levels and factors associated with it among on treatment TB patients, the burden of non-adherence was found to be 7.30%. Factors associated with non-adherence among the studied TB patients included regimen complexity and forgetting to take medications. The prevalence of non-adherence to tuberculosis medication was lower compared to a study previously carried out in Kenya by Buchanan *et al.* in 2018 where prevalence was 35%. This could be due to the small sample size in our study. The 2018 study was carried out in numerous hospitals across fifteen counties in the country hence increasing the chances of getting the true prevalence [8]. The prevalence was also lower compared to a study carried out in Ethiopia by Zegeye *et al.* which found prevalence to be 21.29% [9]. This can be attributed to the program efforts adopted by the government to aggressively manage tuberculosis in Kenya with the aim of promoting cure and preventing relapses and development of multidrug resistant infections [2].

There was a significant association between adherence status and regimen complexity. Individuals who reported to experience complexity of regimen were more likely to be non-adherent as opposed to those who did not. A study carried out in 2020 by Elnaem *et al.* showed medication regimen complexity was one of the major contributors of high prevalence of non-adherence further supporting our study findings [10]. Dispensing individual drugs as opposed to combined pills increased the pill

burden raising the risk of non-adherence. This was confirmed in this study as most participants complained the medications were too many. It was also supported by Pan *et al.* and Gust *et al.* in Botswana [11–13]. Medication regimen simplification should be applied as one of the strategies to promote adherence [10]. Individuals who forgot to take medications were more likely to be non-adherent. This was reiterated by Makonnen and Azagew's findings in Northwest Ethiopia in 2018 [14]as well as the report by Tesfahuneygn *et al.*[15]. The small sample size in this study may have limited out ability to identify more associations linked to non-adherence to ant-TB medications. However, the identified factors are actionable items that can be translated into policy to improve outcomes among TB patients.

CONCLUSION

Forgetfulness and a perception of regimen complexity were associated with non-adherence. Incorporating reminders for patients to take their medications and dispensing fixed dose combinations to minimize pill burden may help to improve adherence among TB patients on treatment.

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