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Healthcare Worker-Related Factors Contributing to Tuberculosis Treatment Non-Adherence among Patients in Kisumu East Sub-County

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Abstract

Background: Treatment non-adherence poses significant risks to health outcomes and impedes the health system's efficiency, hence curtailing progress towards the end Tuberculosis (TB) strategy under SDG 3.3. Despite interventions to address TB treatment non-adherence, Kenya still reports high TB treatment non-adherence rates of 35% and consequently poor treatment outcome rates. Health Care Workers (HCWs) play a critical role in linking the population to health services, yet little is known of their influence on patients' TB treatment non-adherence in Kenya. **Objective:** To analyze HCW-related factors associated with TB treatment non-adherence among patients in Kisumu East Sub-County. **Methods:** Health facility-based analytical cross-sectional mixed-method study. A Semi-structured questionnaire on treatment adherence and patients' perceptions of HCWs during the clinic visit was administered to 102 consenting adult (out of a total census of 107 adults) drug-susceptible TB patients. 12 purposively selected HCWs by rank from 6 health facilities participated in Key Informant Interview sessions. Medication adherence was measured using the Morisky Medication Adherence Scale and then expressed as a dichotomous variable. Quantitative analysis utilized STATA version 15.1 while qualitative deductive thematic analysis was done using NVIVO version 14. **Results:** TB treatment non-adherence rate of 26% (CI: 18% - 36%) was recorded. Overall, patients who felt supported in dealing with the illness were 8 times more likely to adhere to treatment compared to those who were not (aOR = 7.947, 95% CI: 2.214 - 28.527, p = 0.001). Key HCW related factors

influencing adherence to treatment included: friendliness (cOR = 4.31, 95% CI: 1.514 - 12.284, p = 0.006), respect (cOR = 6.679, 95% CI: 2.239 - 19.923, p = 0.001) and non-discriminatory service (cOR = 0.1478, 95% CI: 0.047 - 0.464, p = 0.001), communication [adequacy of consultation time (cOR = 6.563, 95% CI: 2.467 - 17.458, p = 0.001) and patients' involvement in their health decisions (cOR = 3.02 95% CI: 1.061 - 8.592, p = 0.038)] and education and counselling (cOR = 4.371, 95% CI: 1.725 - 11.075, p = 0.002). **Conclusion:** The study results underline importance of patient-centered consultation for TB patients and targeted education and counselling for improved treatment adherence.

Keywords

Tuberculosis, Treatment Adherence, Human Resources for Health

1. Introduction

Tuberculosis (TB) is a public health challenge affecting about a quarter of the global population [1]. In 2022, Sub-Saharan Africa (SSA) contributed 23% of global TB cases, while Kenya was ranked among the 30 high TB burden countries worldwide and 5th in SSA [1]. Treatment adherence is critical in TB control. Kenya has adopted interventions such as Directly Observed Therapy among other strategies to address TB treatment non-adherence [2]. However, Kenya still reports high TB treatment non-adherence rates of 35% [3], in comparison to SSA rates of 26% [4], and consequently poor treatment outcome rates [5].

In 2021, Kenya reported below-threshold TB treatment outcomes *i.e.* Treatment Success Rate (TSR) of 84% against a target of 90%, Loss to Follow-up (LTFU), and Death Rates (DR) of 5.4% and 7% respectively against a target of <5% [6]. Kisumu County reported TSR of 87%, LTFU of 4%, and DR of 9% while Kisumu East sub-county reported TSR of 76%, LTFU of 10%, and DR of 14% in the same year [7]. Studies illustrate significant health risks associated with TB treatment non-adherence including increased risk of incidence of drug-resistant TB; relapse, poor prognosis and TB spread due to prolonged infectiousness [8] [9]. Additionally, studies have linked TB treatment non-adherence to increased cost of treatment since non-adherent patients take longer to convert to negative culture hence longer treatment regimen [9] [10], and higher cost with patient's productivity losses during treatment [11]. Hence, TB treatment non-adherence is among factors curtailing progress toward the end TB strategy under SDG 3.3.

Adherence to long-term therapies is a multi-dimensional phenomenon that entails an interplay of variant factors [12] [13] [14]. The Ministry of Health in its intervention to address the TB epidemic through patient-centered treatment aims to minimize the differential patient-related factors in accessing care and achieving cure [2] [15]. Studies have assessed long-term medication adherence against the entirety of health system related factors. However, none of these stu-

dies has focused on TB treatment adherence. This illustrates the need to assess the implementation of the TB treatment program to assess gaps that could be fueling the high treatment non-adherence rates in the country. Health Care Workers (HCWs) link the population to health services, yet little is known about their influence on patients' TB treatment non-adherence in Kenya. This study aimed to determine HCW-related factors associated with TB treatment non-adherence among patients in Kisumu East Sub-County. Knowledge generated from this study will enable the Ministry of Health (MOH) to identify disparities in TB treatment service provision that, if addressed, will improve TB treatment adherence.

2. Materials and Methods

2.1. Study Area and Population

The study was conducted in Kisumu East Sub County, Kisumu County. As of 2019, TB was ranked the second leading cause of death among communicable, maternal, neonatal, and nutritional diseases in Kisumu [16]. Kisumu East Sub County was purposively selected since it reported the highest TB-related death and LTFU rates at 14% and 10% respectively in the county in 2021 [7], hence an indication of likely challenges with TB treatment adherence. Additionally, the sub-county's peri-urban set-up yields a more representative study population compared to the other sub-counties that are either predominantly rural or urban [17]. The study population consisted of 107 adult (≥18 years) TB patients on anti-TB treatment attending outpatient TB clinics in Kisumu East sub county between the months of June to July 2023.

2.2. Study Design and Sample Size

The study adopted the health facility-based analytical cross-sectional design. A complete census of adult drug-susceptible TB patients on treatment from all 16-outpatient facilities was conducted, realizing 102 (95% of total eligible patients) who consented to participate. For qualitative data, 6 health facilities were purposively selected based on level and ownership *i.e.* Level 2, 3 and 4; private and public ownership, respectively. In each cluster, the health facility with the highest number of TB patients was selected with the assumption that HCWs from these facilities encountered more patients and hence would have rich contribution. This was followed by purposive selection of 2 HCWs per facility by cadre *i.e.* Clinical Officer (for level 3 and 4 facilities) or Nurse (for level 2 facilities) and Community Health Volunteer, hence targeting a minimum of 12 Key Informant Interviews (KIIs), subject to information saturation [18].

2.3. Data Collection Tools and Process

A semi-structured interviewer-administered questionnaire was used for the exit interview with the TB patients. The questionnaire (Appendix 1) adopted the Morisky Medication Adherence Scale (MMAS-8) for assessment of TB treatment

adherence among the study participants as well as questions on the patients' perceptions of the HCWs during the clinic visit. Key Informant Interview (KII) guide (Appendix 2) was used by the investigator for qualitative data collection among the clinical officers (for level 3 and 4 facilities) or nurses (for level 2 facilities) and CHVs at the TB clinic. The entire KII session was audio-recorded upon obtaining written consent from the interviewee.

2.4. Data Processing and Analysis

The study adopted the Open Data Kit (ODK) android application for electronic data collection. Upon completion of the data collection process, the consolidated dataset was exported to STATA (Version 15.1) for cleaning and analysis. The medication adherence score from the Morisky Medication Adherence Scale was transformed to a dichotomous variable (Adherent [MMAS-8 ≥ 6] and Non-adherent [MMAS-8 scores < 6]), for analysis purposes. Logistic regression model was run, crude and adjusted odds ratios (COR and aORs), 95% confidence intervals, and p-values were reported.

For qualitative data, each audio recording was saved using unique identifiers to ensure anonymity of the interviewees. Audios were transcribed in verbatim to generate KII transcripts per session. The transcripts were analyzed deductively using thematic approach on NVIVO version 14.

2.5. Ethical Considerations

The study protocol was cleared by both the JKUAT Institutional Scientific and Ethics Review Committee and the National Commission for Science Technology and Innovations for ethical soundness and approval permit issued (JKU/ISERC/02316/0825 and NACOSTI/P/23/24657) respectively. Entry was done at the MOH offices at the county, sub-county and health facilities for permission to conduct the study.

Study participants were taken through a detailed written consenting process, including objectives of the study, risks and benefits, mitigation measures and the fact that participation was voluntary and that they were free to withdraw from the study at any point without any repercussions. All study participants were assigned anonymous unique identifiers to safeguard their identities. For privacy, data was stored in a password-protected drive only accessible to the principle investigator

3. Results

3.1. Summary of Socio-Demographic Characteristics

Majority of the TB patients were of the male gender at 77 (75%). Over third of the patients were middle-aged (between 18 - 34 years) (36, 35%), followed by those aged between 35 - 39 years at 22 (22%). This corresponds to the median age of the study population of 38 years (IQR = 30 - 44). The elderly population contributed about 11 (11%) patients of the total sample (Table 1). Over a half of

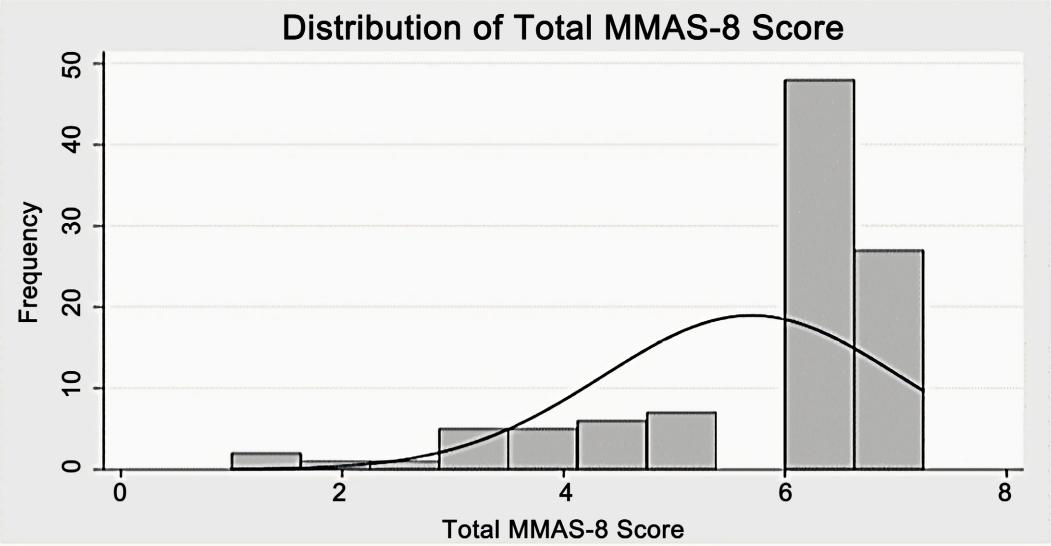
Table 1. Summary patients' socio-demographic characteristics.

Variable	Frequency (n = 102)	Percent (%)
Sex		
Male	77	75.49
Female	25	24.51
Age in Years		
18 - 24	11	10.78
25 - 29	10	9.80
30 - 34	15	14.71
34 - 39	22	21.57
40 - 44	19	18.63
45 - 49	8	7.84
50 - 54	6	5.88
60 and above	11	10.78
Marital Status		
Married	56	54.90
Divorced/Separated/Widowed	18	17.65
Never married	28	27.45
Employment Status		
Employed	28	27.45
Self-employed	23	22.55
Unemployed	51	50.00
Religion		
Christian	102	100.00
Treatment		
Intensive phase	60	58.82
Continuation phase	42	41.18

the TB patients were married at 56 (55%) patients. In terms of the participants' economic characteristics, half of the patients were unemployed at 51 (50%), followed by 28 (28%) who were employed and 23 (23%) patients who were self-employed. Kisumu East is Christian-dominated hence all the patients were Christians. The patients were at various levels of treatment, with more than half being at the intensive phase 60 (59%) hence having taken their treatment for up to 2 months at the time of data collection (Table 1).

3.2. TB Treatment Non-Adherence

This study finds the prevalence of TB treatment non-adherence among TB patients of Kisumu East sub-county to be 26% (CI: 18% - 36%) (Figure 1). The modal and median Total MMAS-8 Score was 6 with scores ranging between 1.25



Descriptive Summary of MMAS-8 Total Score								
n	Mean	Median	IQR	SD	Minimum	Maximum	Adherent (Above 6) [n(%)]	Non-Adherent (Below 6) [n(%)]
102	5.69	6.00	1.25	1.34	1.25	7.25	75 (73.53%)	27 (26.47%)

Figure 1. Prevalence of TB treatment non-adherence.

and 7.25 (IQR = 5.25 - 7.00). The most common indicator among TB patients was that over half of the patients reported that they felt hassled sticking to their treatment plan 57 (56%). This was followed by 25 (25%) who had ever forgotten to take their medication while 21 (21%) had difficulties remembering to take their medication, and 19 (19%) of the patients reported to have ever stopped medication without informing doctor and missed medication over the past 2 weeks. The least common indicators were: dropping medication when patients felt better or worse 10 (10%), forgetting medication while travelling 6 (6%) and not taking all medication the day before the interview 4 (4%) (**Figure 2**).

In corroboration, HCWs reported that during the initial phase of treatment, patients were likely to stop taking their medication due to forgetfulness since this was a new routine to them, or probably when feeling better since the patients lack the urgency to take the treatment when feeling better. Conversely, patients were likely to drop their treatment when they felt worse, attributing this feeling to the medication; hence, they rather their previous state without medication.

> "…then also forgetfulness, since this is something new being introduced, so they can't abide by the time unless they set alarms" [KII_S1HF2].
> "During the first phase, they take the drugs consistently, but once they start getting better, they stop taking the drugs" [KII_S2HF4].
> "Two, whenever they feel worse, they might decide these drugs are making me feel sicker, so why don't I just stop?" [KII_S1HF3]

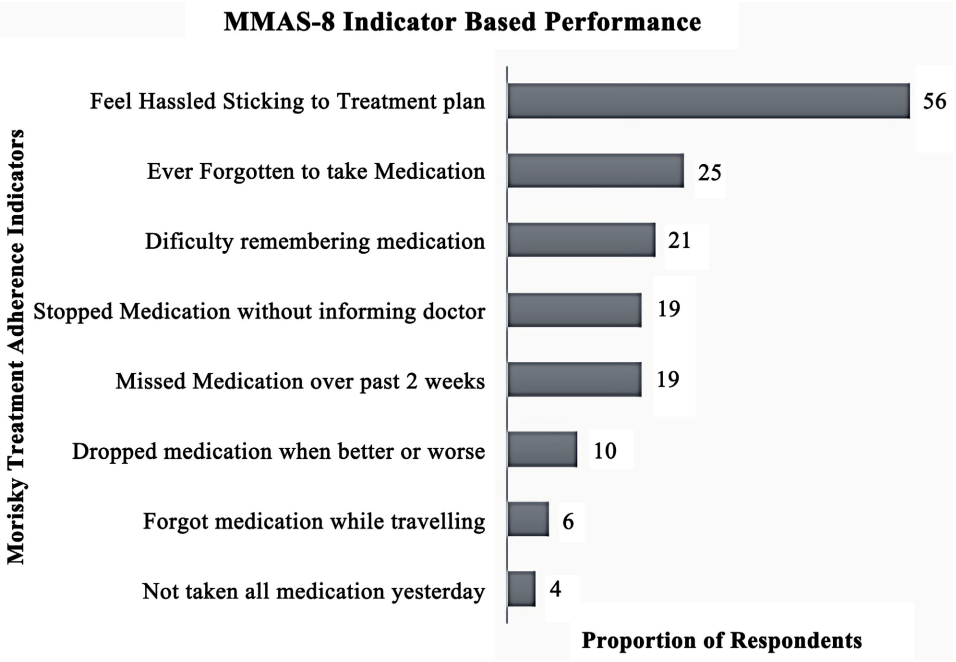


Figure 2. MMAS-8 indicator based performance on TB treatment adherence.

3.3. Health Care Worker-Related Factors Associated with TB Treatment Non-Adherence among TB Patients in Kisumu East Sub-County

This study found that a TB patient's likelihood of adhering to TB treatment is influenced by their experience with the HCW. The study proved a significant association between the patients' perception of their relationship with the HCW, the HCW's attitude, empathy, communication, and education and counselling they receive at the facility, and the odds of treatment adherence.

3.3.1. HCW-Patient Relationship

Patients' perception on HCWs' friendliness was significantly associated to TB treatment adherence. Majority of patients who were uncertain of the HCW's friendliness towards them were non-adherent 10 (53%). Patients who agreed that the HCW was friendly were 4.3 times more likely to adhere to TB treatment compared to those who were uncertain (cOR = 4.31, 95% CI: 1.514 - 12.284, p = 0.006) (Table 2).

3.3.2. HCW Attitude

Patients who found the HCW respectful towards them were 6.7 times more likely adhere to treatment compared to those who were uncertain of the HCWs level of respect towards them (cOR = 6.679, 95% CI: 2.239 - 19.923, p = 0.001). A majority of the patients (n = 86) did not feel discriminated against by the HCW during the TB clinic session. However, patients who were uncertain of whether the HCW made them feel unwanted were 85% less likely to be adherent compared to those who were certain that the HCW did not make them feel unwanted (cOR = 0.148, 95% CI: 0.047 - 0.464, p = 0.001) (Table 2).

Table 2. Bivariate logistic regression of HCW-related factors associated with TB treatment non-adherence.

Variable	Non-Adherent (%) n = 27	Adherent (%) n = 75	Total (%) n = 102	Crude Odds Ratio (95% Confidence Interval	P Value
Health Care Worker Patient Relationship					
HCW was friendly					
Agree	**17 (20.48)**	**66 (79.52)**	**83 (100.00)**	**4.314 (1.514 - 12.284)**	**0.006***
Uncertain	10 (52.63)	9 (47.37)	19 (100.00)	Ref	
HCW wasn't impersonal towards me					
Agree	20 (23.26)	66 (76.74)	86 (100.00)	2.567 (0.848 - 7.766)	0.095
Uncertain	7 (43.75)	9 (56.25)	16 (100.00)	Ref	
HCW treated me courteously					
Agree	21 (24.14)	66 (75.86)	87 (100.00)	2.095 (0.668 - 6.576)	0.205
Uncertain	6 (40.00)	9 (60.00)	15 (100.00)	Ref	
Health Care Worker Attitude					
HCW was respectful					
Agree	**16 (19.05)**	**68 (80.95)**	**84 (100.00)**	**6.679 (2.239 - 19.923)**	**0.001***
Uncertain	11 (61.11)	7 (38.89)	18 (100.00)	Ref	
HCW made me feel unwanted					
Uncertain	**10 (62.50)**	**6 (37.50)**	**16 (100.00)**	**0.1478 (0.047 - 0.464)**	**0.001***
Disagree	17 (19.77)	69 (80.23)	86 (100.00)	Ref	
Health Care Worker Empathy					
Feel supported in dealing with illness					
Agree	**11 (14.47)**	**65 (85.53)**	**76 (100.00)**	**9.455 (3.422 - 26.118)**	**<0.001***
Disagree	16 (61.54)	10 (38.46)	26 (100.00)	Ref	
HCW kept me from worrying					
Agree	17 (22.37)	59 (77.63)	76 (100.00)	1.542 (0.104 - 2.581)	0.423
Uncertain	6 (46.15)	7 (53.85)	13 (100.00)	0.519 (0.422 - 5.634)	0.512
Disagree	4 (30.77)	9 (69.23)	13 (100.00)	Ref	
Health Care Worker Communication					
HCW explained difficult terms					
Agree	21 (24.42)	65 (75.58)	86 (100.00)	1.857 (0.603 - 5.722)	0.281
Disagree	6 (37.50)	10 (62.50)	16 (100.00)	Ref	
HCW explained reason for treatment administered					
Agree	19 (25.00)	57 (75.00)	76 (100.00)	1.333 (0.50 - 3.558)	0.566
Uncertain	8 (30.77)	18 (69.23)	26 (100.00)	Ref	
HCW allowed patient say what they felt was important					
Agree	14 (20.59)	54 (79.41)	68 (100.00)	2.314 (0.718 - 7.46)	0.934
Uncertain	7 (38.89)	11 (61.11)	18 (100.00)	0.943 (0.236 - 3.772)	0.16
Disagree	6 (37.50)	10 (62.50)	16 (100.00)	Ref	

Continued

HCW gave patient adequate time to raise concerns					
Agree	**12 (16.00)**	**63 (84.00)**	**75 (100.00)**	**6.563 (2.467 - 17.458)**	**<0.001***
Disagree	15 (55.56)	12 (144.44)	27 (100.00)	Ref	
HCW involved patient in health decisions					
Agree	**9 (17.65)**	**42 (82.35)**	**51 (100.00)**	**3.02 (1.061 - 8.592)**	**0.038**
Uncertain	7 (30.43)	16 (69.57)	23 (100.00)	1.479 (0.460 - 4.755)	0.511
Disagree	11 (39.29)	17 (60.71)	28 (100.00)	Ref	
HCW paid full attention to my concerns					
Agree	13 (19.40)	54 (80.60)	67 (100.00)	1.510 (0.414 - 5.513)	0.532
Uncertain	10 (50.00)	10 (50.00)	20 (100.00)	0.364 (0.086 - 1.537)	0.169
Disagree	4 (26.67)	11 (73.33)	15 (100.00)	Ref	
Health Care Worker Education and Counselling					
Patient informed of importance of taking treatment					
Agree	23 (25.56)	67 (74.44)	90 (100.00)	1.457 (0.401 - 5.293)	0.568
Uncertain	4 (33.33)	8 (66.67)	12 (100.00)	Ref	
Patient informed of interaction between drugs and nutrition					
Agree	**10 (15.63)**	**54 (84.38)**	**64 (100.00)**	**4.371 (1.725 - 11.075)**	**0.002***
Disagree	17 (44.74)	21 (55.26)	38 (100.00)	Ref	
Patient advised on how to avoid illness					
Agree	22 (25.00)	66 (75.00)	88 (100.00)	1.667 (0.504 - 5.06)	0.402
Disagree	5 (35.71)	9 (64.29)	14 (100.00)	Ref	

3.3.3. HCW Empathy

Across all the 7 HCW related factors that were identified from the bivariate model only one remained significantly associated to TB treatment adherence in the multivariate model (Table 3). The study reported a significant association between patients feeling supported in dealing with the illness and their TB treatment adherence. Majority of the patients who felt supported in dealing with the illness reported adherence to TB treatment (n = 65, 86%) (Table 2). Patients that felt supported in dealing with the illness were 8 times more likely to be adherent compared to those who did not feel supported (aOR = 7.947, 95% CI: 2.214 - 28.527, p = 0.001) (Table 3).

3.3.4. HCW Communication

Across the six indicators of HCW communication, two were significantly associated with the patients' TB treatment adherence. Over half of the patients that felt like the HCW did not allow them adequate time to raise their concerns reported non-adherence, 15 (56%). Patients who were allowed adequate time to raise concerns were 6.6 (cOR = 6.563, 95% CI: 2.467 - 17.458, p < 0.001) times more likely to be adherent compared to those who were not. Additionally, patients that felt involved in the decisions regarding their health were 3 times more

Table 3. Multi-variate logistic regression of HCW-related factors associated with TB treatment non-adherence.

Variable	Adjusted Odds Ratio	95% Confidence Interval	P Value
HCW was friendly			
Agree	3.470	0.832 - 14.448	0.088
Uncertain	Ref		
HCW was respectful			
Agree	3.502	0.812 - 15.100	0.093
Uncertain	Ref		
HCW made me feel unwanted			
Uncertain	0.243	0.049 - 1.195	0.082
Disagree	Ref		
Feel supported in dealing with illness			
Agree	**7.947**	**2.214 - 28.527**	**0.001***
Disagree	Ref		
HCW gave patient adequate time to raise concerns			
Agree	2.259	0.506 - 10.081	0.286
Disagree	Ref		
HCW involved patient in health decisions			
Uncertain	1.024	0.203 - 5.161	0.977
Agree	0.614	0.103 - 3.674	0.593
Disagree	Ref		
Patient informed of interaction between drugs and nutrition			
Agree	4.083	0.949 - 17.561	0.059
Uncertain	Ref		

likely to be adherent compared to those who were not (cOR = 3.02, 95% CI: 1.061 - 8.592, p = 0.038) (Table 2).

HCWs elaborated that inadequate time spent with patients was due to the heavy HCWs' workload at the health facilities. This was especially noted among facilities that did not have a specific TB clinic day; hence, patients would have to spend shorter periods with the HCW to give way to general patients waiting in the queue.

> "…you cannot stay with one client, the whole day when you have almost a hundred or fifty clients who are waiting for you." [KII_S2HF5]
>
> "You have to see various patients; I do MCH, family planning, and TB. So one staff, it is not easy. Sometimes we do not take adequate time with the patients because the workload is too much." [KII_S1HF6]

3.3.5. Education and Counselling

Across the three variables under this construct, patients' information on drugs and nutrition interaction was the least performing, with only 64 (63%) patients accessing this information while the other two indicators reported about 90 patients accessing the information. Close to half of the patients who did not receive information on drug and nutrition interaction were non-adherent 17 (45%). Patients who were informed of the interactions between the treatment, nutrition and other drugs were 4.3 times more likely to report treatment adherence compared to those who were not informed (cOR = 4.371, 95% CI: 1.725 - 11.075, p = 0.002) (Table 2).

The qualitative findings converge with the quantitative findings on education and counselling. HCWs regard education and counselling as critical in preparing the patient psychologically for what is to come during the six months of treatment. Therefore, there's a need to ensure the adequacy of information provided to patients.

> "So if you give this client the interaction between drugs, and this needs to be boosted by this, especially when you are taking ARVs. So at that point the client will have no problem when you give them the right information at the point of initiation. But if you do not give the client the right information, obviously, when they start experiencing these side effects, they start panicking and stop taking the drugs and this is when non-adherence starts kicking in" [KII_S2HF5].

4. Discussion

4.1. Treatment Non-Adherence

The prevalence of treatment non-adherence in Kisumu East Sub-county was reported at 26%, CI: 18% - 36%. The rate of treatment non-adherence was slightly lower than the national average of 35% [19] but within the TB treatment non-adherence rates in sub-Saharan Africa (26%) [4]. The qualitative findings in corroboration to previous studies note that patients are likely to struggle with their treatment schedule in the early phases of their treatment, especially concerning maintaining their treatment dosage intake. A systematic review illustrated patients' perceived barriers as a likely factor that would demotivate them from sticking to the treatment schedule as prescribed [20]. The barriers in this case could include the clinic visits to pick up medication and the nature of the clinic visits among other inconveniences that come with the treatment that would lead to the patient feeling hassled to stick to their treatment plan.

The early phases of treatment where the patient is not used to the treatment schedule increase the likelihood of forgetting to take their medication while adjusting to the treatment schedule, thereby leading to treatment non-adherence. About 10% of the patients reported that they dropped their medication when they felt better or worse. In addition to the nature of TB treatment side effects and in line with the health belief model, the patients' beliefs about the medicine

influence their likelihood of maintaining treatment adherence. Patients who believe the medication is making them worse are more likely to drop treatment due to the doubts they hold in reference to their treatment [20]. Additionally, when a patient feels better, they might stop treatment due to the low perceived seriousness of the disease; hence, they become less vigilant in taking their medication [20].

This study generates new knowledge in illustrating the level of TB treatment non-adherence in Kisumu East sub-county that could be the reason behind poor treatment outcome performance in the sub-county. Additionally, this study brings to light the non-differential TB treatment adherence across various patient related factors; hence, patient related factors had no significant influence on the treatment adherence. On the other hand, the study confirms, in line with existing studies, the need to focus on TB patients at the beginning of treatment to ensure proper education to equip patients with the right skills and knowledge to address potential risks of treatment non-adherence.

4.2. HCW-Patient Relationship

The established association of HCW friendliness with TB treatment adherence is in line with findings elsewhere, including Nili, Mohamed [20] who notes that a patient's perception of their relationship with the HCW is likely to influence their treatment adherence. Additionally, Salifu, Eliason [21] and Finlay, Lancaster [22] reported high TB treatment adherence among patients who reported a warm and cordial relationship with their HCWs in Ghana and South Africa respectively. However, this study's findings contradict the findings of other studies, such as Adane, Alene [23] in South East Ethiopia that reported a 99.3% of the patients had a good relationship with their health care worker and noted that the patient-HCW relationship had no significant effect on the patients' treatment adherence. Kisumu east sub-county had 81% of the patients reporting good relationship with the health care workers, indicating an almost 19% difference to breakeven on the variation in treatment adherence rates. Consequently, this study confirms the importance of HCWs' being friendly to their patients in TB treatment programs, hence motivating patients to attend clinic appointments and confide in their HCWs.

4.3. HCW Attitude

A positive HCW attitude was associated with an increased likelihood of treatment adherence among the patients. This finding is in line with Boru, Shimels [24] study from Ethiopia, which reported that the stigmatizing attitude of HCWs lowers the patient's motivation to attend their scheduled clinics, hence increasing treatment non-adherence. Ibrahim, Hadjia [25] study in Niger noted that the HCWs' attitude was a barrier to treatment adherence among over 80% of their study participants.

Accordingly, this study's findings confirm the critical role of HCWs' respect

for patients in the implementation of a service delivery model that assures patients of equal and non-discriminatory TB services. Kisumu East sub-county is currently experiencing about 6% of its TB patients feeling discriminated against at service delivery points. The qualitative findings of this study compound this phenomenon with the existing stigma that associates TB with HIV/AIDS; hence, patients are still very sensitive to instances of disrespect, isolation, or discrimination. Elsewhere, other studies have also illustrated the need to implement patient-centred approaches in TB service delivery and continuous monitoring of these interventions to ensure implementation of practical reforms at health facility levels to address any human rights-related barriers [26] [27].

4.4. HCW Empathy

The study established a positive association between HCWs' empathy, perceived by patients as "feeling supported in dealing with the illness," and the likelihood of TB treatment adherence. This finding affirm the significance of MOH [2] guidelines that prioritize empathetic HCW as critical in ensuring a patient understands the importance of TB treatment adherence. Therefore, this finding confirms findings of studies elsewhere that noted an increased likelihood of treatment non-adherence when patients do not feel understood by their HCWs [25] [28]. Therefore, this study confirms the need to enhance the empathetic qualities of healthcare workers to improve the level of support patients receive in dealing with TB thereby improving the patients' treatment adherence [29].

4.5. HCW Communication

This study proved that the adequacy of time for patients to raise concerns and patients feeling involved in decisions regarding their health increased the odds of treatment adherence. Limited consultation time was attributed to the heavy workload at the health facilities, hence a limitation to quality HCW-patient communication during clinic visits. However, HCWs noted the critical importance of discussing what the patient is able or not able to do, thereby involving the patient in addressing possible barriers to ensure treatment adherence.

Elsewhere, proper communication between a health care worker and a patient has been shown to play a critical role in TB treatment adherence [21] [30]. As is, 26% of TB patients in Kisumu East sub-county are experiencing the HCW-centred consultation; hence, the feeling of not being allowed adequate time to raise concerns, while 50% of TB patients do not have a say in their health-related decisions. The qualitative findings explained this phenomenon by illustrating the workload of the HCWs at TB clinics. Most TB clinics host the Comprehensive Care Clinics (CCC) and are often manned by one person in the health facility. However, for health facilities without a designated TB clinic day, the HCW is likely to attend to general patients on a day a TB patient could be coming in for treatment. Hence, with the heavy workload at the health facilities, it is unlikely that HCWs give adequate time to patients during the clinic sessions, since they

aim at clearing the queue by the end of the day. This lowers the likelihood of patients raising issues they are facing with treatment; hence if not addressed, such issues tend to lower their adherence to treatment [30]. Studies prove that training HCWs at TB clinics on patient-centred consultation has a positive impact on patients' perceptions of the quality of care which in-turn improves treatment adherence and outcomes [31] [32].

4.6. HCW Education and Counselling

This study, in accordance with the MOH guidelines, established that educating and counselling TB patients on their treatment during the course of therapy among the HCWs' roles is critical to ensuring adherence. In the qualitative findings, HCWs noted that education and counselling prepare the patient psychologically for the seriousness of the disease and the importance of treatment adherence. Additionally, continuous education and counselling are critical during the treatment phase to ensure patients raise concerns and find solutions to address arising issues, thereby facilitating hence facilitate improvement or maintenance of their treatment adherence.

The most critical aspect of education and counselling highlighted in this study was the drug-nutrition interaction that raised the odds of treatment adherence. About 37% of the patients in the sub-county were not educated or counselled on drugs and nutrition interaction. This is in line with the social cognitive theory, where education and persuasion from the HCW equip the patient with knowledge and confidence to address the challenges that might arise during treatment, hence improving treatment adherence [20] [33].

Therefore, while confirming the critical importance of education and counselling for treatment adherence, this study generates new knowledge by highlighting the gap in the education of TB patients, on nutrition and drug interaction. This is an area that is notably missing among about 40% of patients hence the need to foster its inclusion in education and counselling sessions to provide patients with knowledge on how to balance other medications they could be taking, and manage their diet among other factors, to improve adherence to treatment and consequently their health outcomes.

5. Study Limitations

The main study limitation is that treatment adherence was self-reported, hence relying on the patients' honesty and the MMAS-8's reliability and validity.

6. Conclusion

This study, by analyzing healthcare worker-related factors that contribute to tuberculosis treatment non-adherence among patients in Kisumu East Sub-County, identifies key such factors to include communication, attitude, empathy, and HCW-patient relationship. Accordingly, the study highlights the importance of curriculum developers and trainers strengthening and institutionalizing pre-service

and continuous education of HCWs on patient-centred consultation and target-specific education and counselling of patients at the beginning and during treatment to enhance the patients' confidence in addressing any challenges that arise during treatment.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendices

Appendix 1. Semi-Structured Questionnaire

SERVICE DELIVERY FACTORS ASSOCIATED WITH THE LEVEL OF TREATMENT NON-ADHERENCE AMONG TB NON-ADHERENT PATIENTS IN KISUMU EAST SUB-COUNTY

Questionnaire ID No: ……

Interviewer ID: ……..

Section A: Socio-Demographic Characteristics

1. What is your sex? (0) Male; (1) Female
2. Age in Complete years _____
3. Marital Status
   - (1) Married
   - (2) Divorced/Separated
   - (3) Widowed
   - (4) Never Married
4. Employment Status
   - (1) Employed
   - (2) Unemployed
   - (3) Self-employed
   - (4) Retired
5. Religion
   - (1) Christian
   - (2) Muslim
   - (3) Traditional
   - (4) None
6. Phase of TB treatment
   - (1) Intensive Phase
   - (2) Continuation Phase
7. Total Duration of TB treatment (in complete months) _____

Part B: Morisky Medication Adherence Scale (© 2007 Donald E. Morisky)

Item	Yes (0)	No (1)
1. Do you sometimes forget to take your medication?	**Yes (0)**	**No (1)**
2. People sometimes miss taking their medication for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medication?	**Yes (0)**	**No (1)**
3. Have you ever cut back or stopped taking your medication without telling your doctor because you felt worse when you took them?	**Yes (0)**	**No (1)**
4. When you travel or leave home, do you sometimes forget to bring your medication?	**Yes (0)**	**No (1)**
5. Did you take all your medication yesterday?	**Yes (1)**	**No (0)**
6. When you feel like your symptoms are under control, do you sometimes drop taking your medication?	**Yes (0)**	**No (1)**

Continued

7. Taking medicine is a real inconvenience for some people. Do you ever feel hassled sticking to your treatment plan?	**Yes (0)**	**No (1)**

8. How often do you have difficulty remembering to take your medication?
Never/Rarely……0
Once in a While……..1
Sometimes……2
Usually……..3
All the Time……..4

Part C: Health Care Worker Related Factors

How strongly do you agree or disagree with each of the following statements

1 = Strongly Agree; 2 = Agree; 3 = Uncertain; 4 = Disagree; 5 = Strongly Disagree

I. HCW-Patient Relationship

No.	Item	1	2	3	4	5
1	The health care worker (HCW) was friendly					
2	The HCW acted too business-like and impersonal toward me					
3	The doctor treated me in a very friendly and courteous manner					

II. Attitude

No.	Item	1	2	3	4	5
1	The HCW was respectful towards me					
2	The HCW made me feel unwanted					

III. Empathy

No.	Item	1	2	3	4	5
1	I feel supported by the HCW in dealing with the illness					
2	The doctor/nurse did their best to keep from worrying					

IV. Communication

No.	Item	1	2	3	4	5
1	The health care worker used difficult medical terms without explaining					
2	The HCW explained the reason for the treatment he/she administered to me					

Continued

3	I was allowed to ask/say anything that I felt was important					
4	The HCW gave me adequate time to express my concerns					
5	I feel involved in the decisions regarding my health					
6	The HCW paid full attention to my concerns or anything I tried to tell him/her					

V. Education and Counselling

No.	Item	1	2	3	4	5
1	The HCW informed me of the importance of taking my treatment					
2	The HCW informed me of the interaction between various drugs, nutrition and the treatment					
3	The HCW gave me advice on how to avoid illnesses and stay healthy					

Appendix 2. Key Informant Interview Guide

SERVICE DELIVERY FACTORS ASSOCIATED WITH TB TREATMENT ADHERENCE AMONG TB PATIENTS IN KISUMU EAST SUB-COUNTY

KII ID No: ……

Interviewer ID: ……..

1) In your opinion, how do health care workers contribute to TB treatment non-adherence?

2) Adherence to Standards and Guidelines.

a) What challenges do you experience in compliance to TB treatment guidelines.

b) What challenges do you experience in compliance to follow-up of TB patients during treatment phase.

-Probe for: HRH capacity (skill mix, adequacy and workload).

c) Of the challenges mentioned in a and b above, how do you address them.

d) Please describe the process of dissemination of TB treatment guidelines to staff.

-Probe for training of the interviewee; perceived adequacy of training regarding Patient-HCW relations and follow up.

2) Leadership and Governance.

a) In the event that a patient has an issue or complaint regarding the service procedure, please describe the feedback mechanism in place at the facility to facilitate reporting of such issues.

b) Once the issue is reported, describe how the health facility goes about ad-

dressing the issue in the short-term.

c) Please describe any mechanisms in place to address issues raised by TB patients in the long-term.