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ENHANCING ISONIAZID PREVENTIVE THERAPY ADHERENCE IN EASTLANDS, NAIROBI: CHALLENGES AND STRATEGIES

John Kamau Njoroge
School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Kenya

Abstract:
Tuberculosis (TB) remains a formidable global health challenge, particularly for individuals living with HIV (PLHIV). According to the World Health Organization (WHO), TB was ranked among the top ten causes of death for PLHIV in 2016, with a significant impact on global public health. This study sheds light on the alarming resurgence of TB, primarily affecting countries with high HIV prevalence. With over ten million reported TB cases worldwide, of which more than one million involve PLHIV, the need for effective prevention and management strategies is critical. Isoniazid Preventive Therapy (IPT) has emerged as a crucial intervention to mitigate the rising burden of TB, especially in high TB-burden areas. However, the uptake of IPT has been disappointingly low, with just one million newly enrolled PLHIV receiving IPT in 2015. Alarmingly, in 16 high TB burden countries, the coverage of IPT remains as low as 2%. Barriers such as medication costs, resource constraints in managing treatment completion, and supply chain issues pose significant challenges to IPT implementation. Additionally, the shifting of certain tasks related to patient management and medication dispensing presents an ongoing challenge that needs to be addressed to alleviate the burden on both patients and healthcare providers. Africa bears the brunt of the global HIV-positive TB cases, accounting for 74% of all such cases. Over the past two decades, 22 high burden countries (HBCs) have received international attention for their efforts to combat TB. The opportunistic nature of TB makes it a constant threat to individuals living with HIV, particularly during the early months of antiretroviral treatment (ART), whether in resource-constrained or industrialized settings.
Tuberculosis (TB), Isoniazid Preventive Therapy (IPT), HIV-positive individuals, High TB burden countries, Antiretroviral treatment (ART)
Keywords: Physics; Velocity Experiment; Simulated Apparatus

1. Introduction

Infection of Tuberculosis (TB) disease which is triggered by bacillus Mycobacterium tuberculosis affects mostly lungs and is a global health problem. According to WHO in 2016, TB is among the top ten killers of PLHIV globally.[1]Out of 1.4 million deaths, four thousand are of persons living with HIV. Globally, it is estimated that over ten million tuberculosis cases included over one million people living with HIV. Reemerged as a major threat to global public health, TB cases have been reported mostly in countries with high HIV prevalence[2].

Uptake of Isoniazid Preventive Therapy (IPT) to reduce increased cases of tuberculosis sickness has been poor, mostly in areas with high tuberculosis burden. Only one million PLHIV freshly registered in HIV care were confirmed to have taken IPT in the year 2015[1]. For instance out of 16 high TB burden nations who confirmed treatment of IPT had a low cover of as little as 2% [1]. The medication cost, human resources to deal with treatment completion and chain of supply remains a programmatic concern and evidence as

significant barriers. Even as the uptake of IPT has been increasing another challenge arises from methods of an appropriate shift to some tasks of management of the patient and medical dispensing which need to be minimized if the burden for both patients and healthcare workers is to be reduced. Continued monitoring remains one of the main options used to deal with cases globally[3].

Africa leads with the most HIV positive TB cases at 74% of all the cases globally[4]. With 81% accounted cases since the year 2000, about 22 high burden countries (HBCs) have received attention at the global level[5]. Tuberculosis is an opportunist disease that is easily acquired by HIV positive persons in their first months of antiretroviral treatment (ART) in both resource constrained and industrialized settings.

Even though ART is significant in reducing HIV cases, there are many cases where it is found not to entirely reduce TB disease risks in the continent[6]. There are high cases of mortality and morbidity because of drug resistant and sensitive TB amongst HIV positive patients. Regular screening is vital of all PLHIV for active TB to provide them with treatment or encourage preventive therapy. The World Health Organization recommends TB preventive therapy for both young and aged HIV infected people to be isoniazid daily for at least 6 months[7].

In Kenya, case notification has gone up at an average of 16% yearly. The implementation guidelines target is to ensure 70% of the cases are detected and 85% of them cured[8]. As such, Tuberculosis (TB) and HIV coinfection in Kenya has remained the major threat and challenge to the health sector. In 2016 the overall TB incidences for Kenya was 169,000 that is approximately 348 per 100,000 population. Nonetheless, there was noticeable reduction of cases of HIV/TB rate that fall to 30% from 45% between the years 2006 and 2008 in Kenya.

The WHO recommend three interventions that can aid in reducing TB burden amongst PLHIV in Kenya. These three interventions are, isoniazid preventive therapy (IPT), Intensified TB case finding (ICF) and infection control for TB. It is proof that use of IPT helped in the successful reduction of TB risk in PLHIV between 34% to 68% up to four years[9]. IPT is suggested for persons with standard underlying Mycobacterium tuberculosis infection to stop its development into disease. WHO recommended a dose of 10 mg/kg daily for young children and 300 mg/kg for adults? It also recommended minimum of IPT for children and adults for six months especially for pregnant mothers, people with active AIDS infections and persons who have undergone complete TB treatment successful. Kenya then adopted a six months IPT regimen for eligible individual in the year 2011.

2. Materials and Methods.

The study was conducted among HIV positive patients in TB treatment centers of 4 Public Health Facilities in Eastlands Nairobi County in Kenya.

2.1 Study Design: This was a descriptive cross-sectional study design that adopted a mixed methods approach using both quantitative and qualitative methodologies in data collection.

2.2 Study location: The study was done in Nairobi City County, which has an estimated population of about 5 million. Nairobi has over 15 informal settlements, with an estimate of 3 million (70%) of the population living in informal settlements. This was a study conducted at 4 TB treatment centers within the informal settlements of Nairobi City County. The specific centers were Mama Lucy Referral Hospital, Kayole I Sub-district Hospital (Kayole), Kayole II Health Center (Dandora) and Umoja I health center.

2.3 Sample size: 266 participants ,250 participants took part in the quantitative part and 16 respondents for the qualitative part which was done purposively.

Sample size calculations: Sample size determination was calculated using Fishers *et al* 1998 formula.

$\mathbf{n = Z^2 p(1-p)}$ $\quad n = \frac{(1.96)^2 (0.5) (0.5)}{\mathbf{d^2}0.05^2} = 384.16$

For populations less than 10, 000, a correction formula was used.

$nf = \frac{n}{1+n/N}$ nf=$\frac{384}{1+384/553}$ =226.63 =227

An addition 10% (23) of respondents was also included to cater for non-respondents making the total sample size to be 250 people. The table below shows the proportionate sampling from four facilities.

2.4 Sampling techniques: Nairobi City County was purposively sampled. This is because the county is the capital city of the country with the most informal settlements with surging cases of HIV AIDS. The four health facilities were purposively selected for inclusion in the study. Mama Lucy Referral hospital, Kayole I, Kayole II and Umoja I health centers selected because they are TB treatment centers within the informal settlements in Nairobi. The primary respondents were systematically sampled using a predetermined sampling interval calculated by dividing the total estimate population with the required sample size. The first respondent was randomly selected using folded pieces of paper using yes/no riffles. The subsequent respondents were systematically sampled at an interval of two. Every second successful respondent was selected until a sample size of 250 was reached. The respondents selected were proportional to the number of HIV positive patients in selected facilities. The study also purposively selected two healthcare workers and two community health workers from each of the hospitals as key informants in the study. Therefore, a total of 16 key informants were included.

2.5 Inclusion criteria: The study included PLHIV aged 18 years and above attending the HIV comprehensive care clinic at the selected health care facilities. They must have been residents in the location where the health facilities are situated to avoid imported cases. They must have been on IPT for at least 90 days and consented to participate in the study.

2.6 Exclusion criteria: The study excluded HIV positive patients who had been confirmed to have tested TB positive. Those who were too sick and unable to participate were also excluded.

2.7 Procedure methodology: A Research questionnaire was used to collect quantitative data from primary respondents.A key informant interview schedule was used to collect qualitative data from key informants. **Statistical analysis:** Information was coded by the researcher before entering them into a spreadsheet followed by analysis using statistical package for social sciences (SPSS) version 20.0. Descriptive statistics for quantitative data were calculated and later presented in frequency tables, pie charts and graphs. Inferential statistics were also calculated using Chi square tests at 95% confidence interval with p-values less than 0.05 considered significant and presented in cross-tabulations. This was used to show the association between independent and dependent variables. Qualitative data was analyzed using thematic analysis. A coding framework was developed after thorough reading of the transcripts, and it was further discussed and applied to the transcripts in Atlas.ti as per the thematic analysis guidelines of Creswell [Creswell 2009] and Moustakas [Moustakas 1994].

2.8 Ethical Considerations: Research approval and authorization was sought from the JKUAT board of postgraduate studies (BPS). Ethical approval was obtained from KNH/UON ethics and research committeeREF P883/11/2019as the institutional review board (IRB) before commencing the recruitment of participants.

Research authorization and permit was sought from the National Commission for Science Technology and Innovation (NACOSTI)

3. Results

3.1 Response rate

The study administered 250 questionnaires to selected HIV positive patients in selected public hospitals in Eastlands, Nairobi City County, Kenya. Duly filled and returned questionnaires were taken into account and considered for analysis. After data checking and cleaning, 227 questionnaires were deemed fit for analysis representing a response rate of 90.8%.

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Health facility	Centre Population	Sample size	Response rate
Mama Lucy Kibaki Hospital	349	158 (63.2%)	143
Kayole I Health Centre	65	29 (11.6%)	26
Kayole II Health Centre	82	37 (14.8%)	33
Umoja I Health Centre	57	26 (10.4%)	25
Totals	**553**	**250 (100.0%)**	**227(90.8%)**

3.2 Socio-demographic characteristics of the respondents

The study sought to understand the socio-demographic characteristics of the participants and more than half 125 (55.1%) of the respondents were male while the rest 102 (44.9%) were females. Regarding the respondents' marital status results showed that 133 (58.6%) of the respondents were married followed by 63 (27.8%) of them who were single and 31(13.7%) were separated/divorced. On respondents' age, 78 (34.4%) of them were aged between 28-37 years followed by 69 (30.4%) who were aged between 18-27 years. The mean age was 31.6 years. Concerning the respondents' highest level of education attained results revealed that more than half 127 (55.9%) of the respondents had attained secondary level followed by 60 (22.0%) who had tertiary level of education and 36(15.9%) had primary level education.

Slightly more than half 118 (52.0%) of the respondents were self-employed followed by 63 (27.8%) who were employed and 46(20.3%) were unemployed. Concerning the respondents' stage of HIV, results showed that 75(33.0%) were in Stage 1 followed by 58 (25.6%) who were in Stage 2, 42(18.5%) were in stage 3 and 52(22.9%) were in stage 4 of HIV. More than half 126 (55.5%) of the respondents were in Walking Functioning status followed 59 (26.0%) who were bedridden and 42(18.5%) were ambulatory. Regarding duration the respondents had been under comprehensive care clinic (CCC), slightly more than half 119 (52.4%) of them had been under the care between 4-7 years followed by 59 (26.0%) who had been under the care for a period of 3 years and below and 49(21.6%) had been under care for more than 8 years as shown in table 3.1

Table 3.2: Distribution of socio-demographic characteristics among respondents (n=227)

Variable	Respondent response	Frequency (N)	Percentage (%)
Gender	Male	125	55.1
	Female	102	44.9
Marital status	Single	63	27.8
	Married	133	58.6
	Separated/divorced	31	13.7
Age in years		69	30.4
		78	34.4

	18-27 28-37 38-47 48-57 ≥ 58	32	14.1
		26	11.5
		22	9.7
	Mean age	31.6 years	
Highest level of education attained	No formal education	14	6.2
	Primary	36	15.9
	Secondary	127	55.9
	Tertiary	60	22.0
Occupation	Unemployed	46	20.3
	Self-employed	118	52.0
	Employed	63	27.8
Stage of HIV	Stage 1	75	33.0
	Stage 2	58	25.6
	Stage 3	42	18.5
	Stage 4	52	22.9
Functioning status	Walking	126	55.5
	Ambulatory	42	18.5
		59	26.0
Duration in CCC care		59	26.0
	Bedridden ≤ 3 years 4-7 years ≥ 8 years	119	52.4
		49	21.6

3.3 Adherence to Isoniazid Preventive Therapy

3.3.1 Proportion of respondents completed IPT

The study sought to find out the proportion of respondents who adhered to isoniazid preventive therapy which was measured by determining those completing at least 90% of IPT among HIV positive patients. The results showed that 164 (72.2%) of the respondents adhered to isoniazid preventive therapy while the rest 63 (27.8%) had not adhered. Results were as shown in the figure 3.3below:

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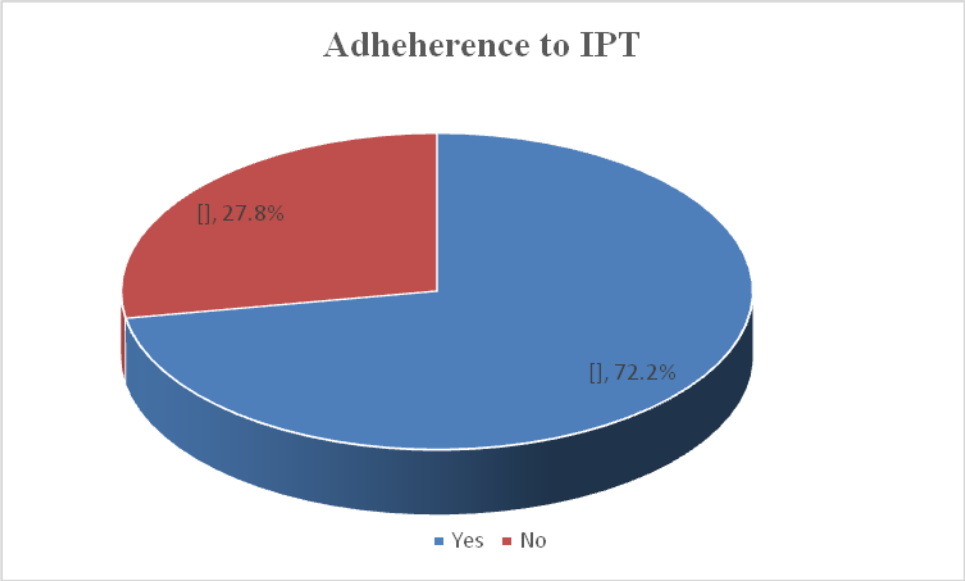

Fig 3.3: Rate of adherence to IPT among respondents

3.3.2 Reasons for not completing IPT

The researcher sought to find out the reasons for not completing isoniazid preventive therapy among the respondents. Results revealed that 19 (27.5%) of the respondents had not completed due to them being suspected of having TB by health care provider followed by 17 (24.6%) who did not complete because of their self-initiative. Results were as shown in figure 3.2 below. However, this was not supported by qualitative results as one of the healthcare providers reported.

*"...Some of the patients come and pick the IPT drugs for a period and abscond subsequent visits to the clinic. This has been a challenge since we are unable to trace all of them. However, as a facility we are trying to make follow ups with the patients and their colleagues..."***(KII 015).**

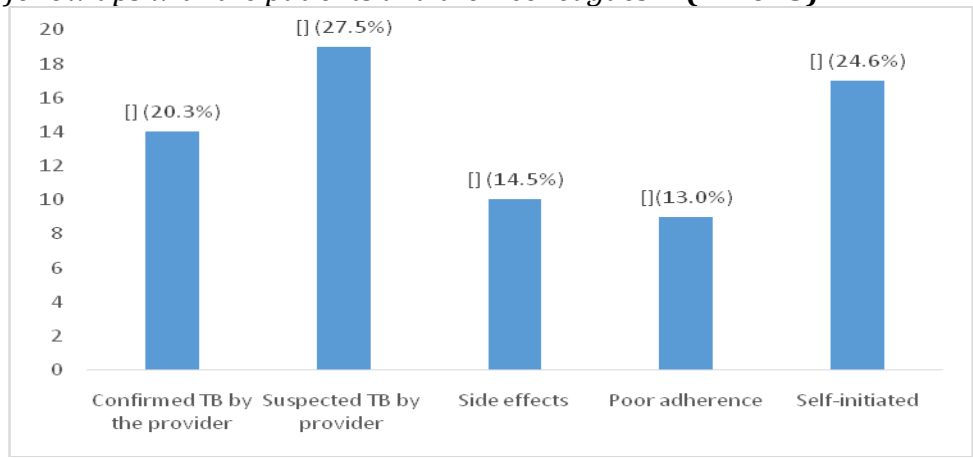

Fig 3.3: Reasons for non-completion of IPT among respondents

3.3.3 Role of IPT

The researcher sought to enquire whether the respondents understood the role of isoniazid preventive therapy. Results showed that more than half 133 (58.6%) indicated that the role of isoniazid preventive therapy was to treat TB followed by 64 (28.2%) who revealed that it helped in preventing TB. Results were as shown in figure 3.3:

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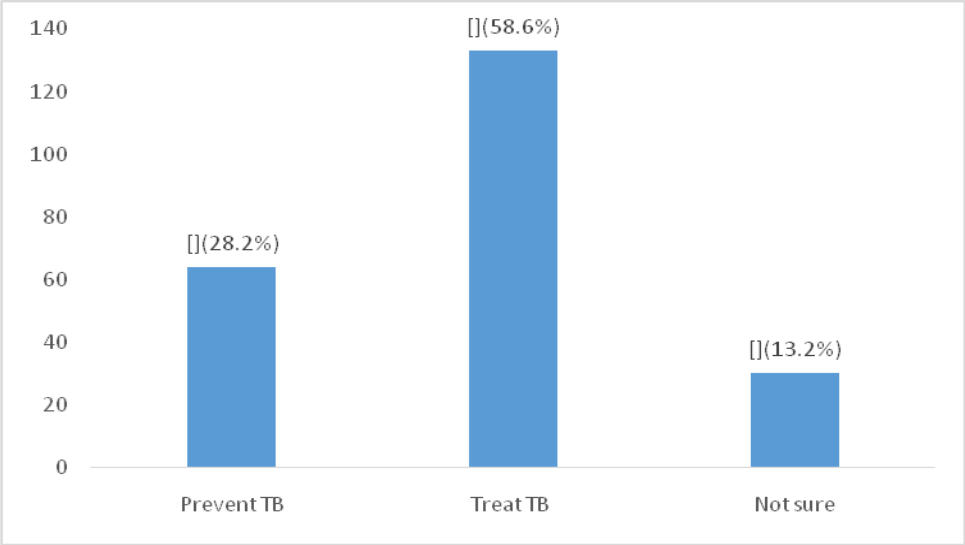

Fig 3.4: Role of IPT among respondents

3.3.4 Socio-demographic factors associated with IPT on adherence

On the association of IPT adherence, most 49 (77.8%) of the respondents who had not adhered to isoniazid preventive therapy were male. There was no significant statistical association between gender and adherence to isoniazid preventive therapy (p=0.492). More than half 94 (57.3%) of the respondents who were married had adhered to isoniazid preventive therapy.

There was a significant statistical association between marital status and adherence to isoniazid preventive therapy (p=0.018). These findings were supported by qualitative results. One of the key informants explained.

"…Throughout my nursing experience, have seen more women taking keen interest in completing their IPT drug dosages. Most men drop out of their treatment because of peer pressure and personal perceptions which need to be addressed so that this could be resolved. Also, those patients who feel supported by their spouses feel motivated to comply with the treatment guidelines…" (**KII 014**)

The results revealed that 64 (39.0%) of the respondents who were aged between 28-37 years had adhered to isoniazid preventive therapy. There was no significant statistical association between age and adherence to isoniazid preventive therapy (p=0.071). More than half 89 (54.3%) of the respondents who had attained secondary level of education had adhered to isoniazid preventive therapy. There was a statistically significant association between highest level of education attained and adherence to isoniazid preventive therapy (p=0.001).

Slightly less than half 81 (49.4%) of the respondents who were self-employed had adhered to isoniazid preventive therapy. There was a significant statistical association between occupational status and adherence to isoniazid preventive therapy among the respondents (p=0.001). Regarding stage of HIV results revealed that 59 (36.0%) of the respondents who were in stage 1 had adhered to isoniazid preventive therapy. There as a significant statistical association between stage of HIV and adherence to isoniazid preventive therapy (p=0.013). One of the key informants explained during the KII sessions.

"…During clinics, I receive excuses from patients who sometimes miss to attend clinics as indicated in their booking cards as

*they claim to be involved in demanding chores and work engagements to provide for their families… Money also is another issue because they have to facilitate themselves to visit this facility for medication…"***(KII 010)**.

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Majority 101 (61.6%) of the respondents who were in walking functional status had adhered to isoniazid preventive therapy. There was a significant statistical association between functional status and adherence to isoniazid preventive therapy (p=0.054). More than half 91 (55.5%) of the respondents who had been under the CCC between 4-7 years had adhered to isoniazid preventive therapy. There was an association between duration under CCC and adherence to isoniazid preventive therapy (p=0.002). The results are as presented in table 4.3 below:

Table 3.3: Socio-demographics associated with IPT adherence among respondents (n=227).

Independent variable	**Respondent response**	**Adherence to IPT**		**Statistical significance**
		Yes (N=164)	**No (N=63)**	
Gender	Male	76(46.3%)	49(77.8%)	χ^2=5.473 df=1 p=0.492
	Female	88(53.7%)	14(22.2%)	
Marital status	Single	48(29.3%)	15(23.8%)	χ^2=7.993 df=2 p=0.018
	Married	94(57.3%)	39(61.9%)	
	Separated/divorced	22(13.4%)	9(14.3%)	
Age in years	18-27	44(26.8%)	25(39.7%)	χ^2=23.971 df=4 p=0.071
	28-37	64(39.0%)	14(22.2%)	
	38-47	24(14.6%)	8(12.7%)	
	48-57	15(9.1%)	11(17.5%)	
	≥ 58	17(10.4%)	5(7.9%)	
Highest level of education attained	No formal education	8(4.9%)	6(9.5%)	χ^2=7.029 df=3 p=0.001
	Primary	26(15.8%)	10(15.9%)	
	Secondary	89(54.3%)	38(60.3%)	
	Tertiary	41(25.0%)	9(14.3%)	
Occupation	Unemployed	35(21.3%)	11(17.5%)	χ^2=27.990 df=2 p=0.001
	Self-employed	81(49.4%)	37(58.7%)	
	Employed	48(29.3%)	15(23.8%)	
Stage of HIV	Stage 1	59(36.0%)	16(25.4%)	χ^2=14.645 df=3 p=0.013
	Stage 2	31(18.9%)	27(42.8%)	
	Stage 3	31(18.9%)	11(17.5%)	
	Stage 4	43(26.2%)	9(14.3%)	
Functioning status	Walking	101(61.6%)	25(39.7%)	χ^2=10.437 df=2 p=0.054
	Ambulatory	29(17.7%)	13(20.6%)	
	Bedridden	34(20.7%)	25(39.7%)	
Duration in CCC care	≤ 3 years	41(25.0%)	18(28.6%)	χ^2=2.459 df=2 p=0.002
	4-7 years	91(55.5%)	28(44.4%)	
	≥ 8 years	32(19.5%)	17(27.0%)	

3.4 Patient-provider interaction and adherence to IPT

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3.4.1 Patient-provider interaction factors

More than half 132 (58.1%) of the respondents revealed that the attitude of health care workers was fair followed by 55 (24.2%) who felt the attitude was poor. On whether the hospital had enough workers, 88 (38.8%) agreed followed by 70 (30.4%) who disagreed. Whether the respondents felt they were being treated well whenever they visited the clinics, 95 (41.9%) were neutral followed by 68 (30.0%) who agreed.

Less than half 101 (44.5%) of the respondents agreed that healthcare workers provided them with adequate information on isoniazid preventive therapy followed by 81 (35.7%) who disagreed. On whether the time taken for isoniazid preventive therapy at the hospital was effective, 90 (39.6%) disagreed followed by 78 (34.4%) who agreed. Slightly below half 111 (48.9%) of the respondents agreed that they had a better understanding of isoniazid preventive therapy followed by 82 (36.1%) who disagreed. The results were as presented in table 3.3 below

Table 3.4: Distribution of patient-provider interaction factors among respondents (n=227)

Variable	Respondent response	Frequency (N)	Percentage (%)
Healthcare workers attitude	Poor	55	24.2
	Fair	132	58.1
	Good	40	17.6
The hospital has enough workers for IPT	Disagree	70	30.8
	Neutral	69	30.4
	Agree	88	38.8
I get treated well whenever I visit the clinic	Disagree	64	28.2
	Neutral	95	41.9
	Agree	68	30.0
Healthcare workers provide adequate information on IPT	Disagree	81	35.7
	Neutral	45	19.8
	Agree	101	44.5
Time taken for IPT in the hospital is effective	Disagree	90	39.6
	Neutral	59	26.0
	Agree	78	34.4
I have a better understanding of IPT	Disagree	82	36.1
	Neutral	34	15.0
	Agree	111	48.9

3.4.2 Influence of patient-provider interaction on adherence to IPT

The researcher sought to determine the influence of patient-provider interaction on adherence to isoniazid preventive therapy. Results revealed that most 113 (68.9%) of the respondents who had reported fair

healthcare workers' attitude had adhered to isoniazid preventive therapy. There was a significant statistical association between perceived healthcare workers' attitude and adherence to isoniazid preventive therapy (p=0.033). More than half 34 (54.0%) of the respondents who had disagreed that the clinic had enough health workers had not adhered to isoniazid preventive therapy. There was no statistical association between hospital having enough workers for IPT and adherence to isoniazid preventive therapy (p=0.220).

Slightly less than half 30 (47.6%) of the respondents who were neutral on whether they were treated well whenever they visited the clinic did not adhere to isoniazid preventive therapy. There was no significant statistical association between getting treated well and adherence to isoniazid preventive therapy (p=0.407). Results also revealed that 69 (42.1%) of the respondents who had agreed that healthcare workers provided adequate information on IPT had adhered to isoniazid preventive therapy. There was significant statistical association between healthcare workers providing adequate information and adherence to isoniazid preventive therapy (p=0.008). However, according to one of the key informants.

"We try to provide the patients with relevant information regarding their need for enrollment in IPT and the importance of adhering to the strict guidelines. However, sometimes because of the workload may not be able to meet the individual needs of every patient. As the facility, we share information through charts, posters and brochures which we give to patients during clinics and advise them to read…" (**KII 006**).

Concerning effectiveness of time taken for IPT in the hospital 66 (40.2%) who had disagreed had adhered to isoniazid preventive therapy. There was no statistical association between effectiveness of the time taken for IPT and adherence to isoniazid preventive therapy (p=0.536).

Regarding respondents' better understanding of IPT, results revealed that 73 (44.5%) who agreed they had a better understanding had adhered to isoniazid preventive therapy. Further results revealed that there was a significant statistical association between having a better understanding of IPT and adherence to isoniazid preventive therapy (p=0.049). The results were as presented in table 4.5 below:

Table 3.5: Patient-provider interaction characteristics among respondents (n=227)

Variable	Respondent response	Adherence to IPT		Statistical significance
		Yes (N=164)	No (N=63)	
Perceived healthcare workers attitude	Poor	28(17.1%)	27(42.8%)	χ^2=6.814 df=2 p=0.033
	Fair	113(68.9%)	19(30.2%)	
	Good	23(14.0%)	17(27.0%)	
The hospital has enough workers for IPT	Disagree	36(22.0%)	34(54.0%)	χ^2=3.028 df=2 p=0.220
	Neutral	53(32.3%)	16(25.4%)	
	Agree	75(45.7%)	13(20.6%)	
I get treated well whenever I visit the clinic	Disagree	46(28.0%)	18(28.6%)	χ^2=1.798 df=2 p=0.407
	Neutral	65(39.6%)	30(47.6%)	
	Agree	53(32.3%)	15(23.8%)	
Healthcare workers provide adequate information on IPT	Disagree	58(35.4%)	23(36.5%)	χ^2=9.584 df=2 p=0.008
	Neutral	37(22.5%)	8(12.7%)	
	Agree	69(42.1%)	32(50.8%)	

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Time taken for IPT in the hospital is effective	Disagree	66(40.2%)	24(38.1%)	χ^2=1.248 df=2 p=0.536
	Neural	45(27.4%)	14(22.2%)	
	Agree	53(32.3%)	25(39.7%)	
I have a better understanding of IPT	Disagree	67(40.9%)	15(23.8%)	χ^2=6.032 df=2 p=0.049
	Neutral	24(14.6%)	10(15.9%)	
	Agree	73(44.5%)	38(60.3%)	

3.5 Patient-related factors associated with adherence to IPT

3.5.1 Patient-related factors

Majority of 158 (69.6%) of the respondents felt persuaded to complete the isoniazid preventive therapy while the rest 69 (30.4%) were not. More than half 131 (57.7%) of the respondents did not fear INH side effects while on IPT while the rest 96 (42.3%) feared. Most 177 (78.0%) of the respondents indicated that there were no cultural beliefs on HIV/AIDS while the rest 50 (22.0%) felt that there were some cultural beliefs about HIV/AIDS.

Majority 144 (63.4%) of the respondents felt stigmatized when they used IPT while the rest 83 (36.6%) did not. Most 163 (71.8%) of the respondents believed in isoniazid preventive therapy in the facility while the rest 64 (28.2%) did not. The results were as presented in table 4.6 below

Table 3.6: Distribution of patient-related factors among respondents (n=227)

Variable	Respondent response	Frequency (N)	Percentage (%)
I feel persuaded to complete IPT	Yes	158	69.6
	No	69	30.4
Fear of INH safety	Yes	96	42.3
	No	131	57.7
Existence of some cultural beliefs about HIV/AIDS	Yes	50	22.0
	No	177	78.0
I feel stigmatized when I participate in IPT	Yes	144	63.4
	No	83	36.6
I belief in IPT treatment in this facility	Yes	163	71.8
	No	64	28.2

3.5.2 Influence of patient-related factors on IPT adherence

The researcher sought to establish the influence of patient-related factors on adherence to isoniazid preventive therapy among the respondents.

Results revealed that most 117 (71.3%) of the respondents who felt persuaded to complete IPT had adhered to isoniazid preventive therapy. There was a significant statistical association between feeling persuaded to complete IPT and adherence to isoniazid preventive therapy (p=0.028). Majority 100 (61.0%) of the respondents who did not fear INH safety had adhered to isoniazid preventive therapy. There

was a statistically significant association between fear of INH safety and adherence to isoniazid preventive therapy (p=0.018).

The results revealed that most 128 (78.0%) of the respondents who adhered to isoniazid preventive therapy were not aware on the existence of any cultural beliefs about HIV/AIDS. There was a significant statistical association between existence of cultural beliefs about HIV/AIDS and adherence to isoniazid preventive therapy (p=0.016). Most 103 (83.5%) of the respondents who felt stigmatized when they participated in IPT adhered to isoniazid preventive therapy. There was no significant statistical association between feeling stigmatized when participating in IPT and adherence to isoniazid preventive therapy (p=0.750). One of the key informants said.

"…Some of my staff members say that their patients tell them they fear being seen by their friends that they are using HIV medication. They prefer attending facilities which they believe they are likely not to meet someone they know…These issues surrounding stigma and discrimination especially among people living with HIV has been a challenge for administering these IPT drugs in this region…" (**Healthcare provider**).

Majority 137 (83.5%) of the respondents who believed in IPT treatment adhered to isoniazid preventive therapy. There was a statistically significant association between believing in IPT treatment in the facility and adherence to isoniazid preventive therapy among the respondents (p=0.001). The results were as presented in table 4.7 below:

Table 3.7: Patient-related factors associated with adherence to IPT among respondents (n=227)

Variable	Respondent response	Adherence to IPT		Statistical significance
		Yes (N=164)	No (N=63)	
I feel persuaded to complete IPT	Yes	117(71.3%)	41(65.1%)	χ^2=9.844 df=1 p=0.028
	No	47(28.7%)	22(34.9%)	
Fear of INH safety	Yes	64(39.0%)	32(50.8%)	χ^2=2.583 df=1 p=0.018
	No	100(61.0%)	31(49.2%)	
Existence of some cultural beliefs on HIV/AIDS	Yes	36(22.0%)	14(22.2%)	χ^2=7.002 df=1 p=0.016
	No	128(78.0%)	49(77.8%)	
I feel stigmatized when I participate in IPT	Yes	103(62.8%)	41(65.1%)	χ^2=5.102 df=1 p=0.750
	No	61(37.2%)	22(34.9%)	
I belief in IPT treatment in this facility	Yes	137(83.5%)	26(41.3%)	χ^2=53.668 df=1 p=0.001
	No	27(16.5%)	37(58.7%)	

3.6 Socio-environmental factors and adherence to IPT

3.6.1 Socio-environmental factors

Slightly more than half 123 (54.2%) of the respondents agreed that sometimes there was stock out of drugs in the facility followed by 63 (27.8%) who disagreed. On distance to the facility, results revealed that 95

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(41.9%) of the respondents were neutral followed by 75 (33.0%) of those who disagreed that the distance to the facility from their homes was far.

Less than half 97 (42.7%) of the respondents agreed that their family and friends were always there to support them followed 75 (33.0%) who disagreed. Further results revealed that 104 (45.8%) of the respondents did not feel afraid to seek permission from the employer to go for IPT treatment followed by 77 (33.9%) who could not tell. The results were as presented in the table 4.8 below:

Table 3.8: Distribution of socio-environmental factors among respondents (n=227)

Variable	Respondent response	Frequency (N)	Percentage (%)
Sometimes there are stock out of drugs in this facility	Disagree	63	27.8
	Neutral	41	18.1
	Agree	123	54.2
The distance to this facility from my home is far	Disagree	75	33.0
	Neutral	95	41.9
	Agree	57	25.1
My family and friends are always there to support me	Disagree	75	33.0
	Neutral	55	24.2
	Agree	97	42.7
I feel afraid to seek permission from the employer to go for IPT treatment	Yes	46	20.3
	No	104	45.8
	Cannot tell	77	33.9

3.6.2 Socio-environmental factors associated with IPT adherence

The researcher sought to determine the association between socio-environmental factors and adherence to isoniazid preventive therapy. Slightly below half 79 (48.2%) of the respondents who were neutral with regards to the distance to the facility being far had adhered to isoniazid preventive therapy. There was no significant statistical association between distance to the facility being far and adherence to isoniazid preventive therapy (p=0.086). Results revealed that more than half 96 (58.5%) of the respondents who agreed that sometimes there were stock out of drugs in the facility had adhered to isoniazid preventive therapy. There was a significant statistical association between occasional drug stock out and adherence to isoniazid preventive therapy (p=0.002). These results were supported by qualitative data in which one of the key respondents said;

"…Sometimes we run out of stock for IPT drugs. So patients may come and miss them during their scheduled clinics. This discourages them and they may fail to come even when the drugs are available thinking still the drugs are not there affecting their compliance rates. I think most essential drugs should be given more priority in terms of procurement by respective departments." (**KII 009**).

Concerning family and friends always being there to support them, results revealed that 65 (39.6%) of the respondents who agreed had adhered to isoniazid preventive therapy. There was a statistically significant association between family and friends being always there to support and adherence to isoniazid

preventive therapy (p=0.009). Further, the results revealed that 83 (50.6%) of the respondents who did not feel afraid to seek permission from the employer to go for IPT treatment had adhered to isoniazid preventive therapy. There was significant statistical association between feeling afraid to seek for permission from the employer to go for IPT treatment and adherence to isoniazid preventive therapy (p=0.001). Results were as presented in table 4.9 below:

Table 3.9: Socio-environmental factors associated with IPT adherence among respondents (n=227)

Independent variable	Respondent response	Adherence to IPT		Statistical significance
		Yes (N=164)	No (N=63)	
Sometimes there are stock out of drugs in this facility	Disagree	35(21.3%)	28(44.4%)	χ^2=12.207 df=2 p=0.002
	Neutral	33(20.1%)	8(12.7%)	
	Agree	96(58.5%)	27(42.9%)	
The distance to this facility from my home is far	Disagree	50(30.5%)	25(39.7%)	χ^2=4.898 df=2 p=0.086
	Neutral	79(48.2%)	16(25.4%)	
	Agree	35((21.3%)	22(34.9%)	
My family and friends are always there to support me	Disagree	59(36.0%)	16(25.4%)	χ^2=9.412 df=2 p=0.009
	Neutral	40(24.4%)	15(23.8%)	
	Agree	65(39.6%)	32(50.8%)	
I feel afraid to seek permission from the employer to go for IPT treatment	Yes	22(13.4%)	24(38.1%)	χ^2=17.382 df=2 p=0.001
	No	83(50.6%)	21(33.3%)	
	Cannot tell	59(36.0%)	18(28.6%)	

4.0 Discussions

4.1 Socio-demographic factors

The study sought to find out the socio-demographic factors associated with adherence to isoniazid preventive therapy among people living with HIV/AIDS in selected facilities in Nairobi City County. The results from this study revealed that majority (55.1%) of the respondents were male. This finding was inconsistent with a study done in South Africa on IPT implementation, it was reported that majority of the respondents were female[10]. There was no significant statistical association between gender and adherence to isoniazid preventive therapy. However, most of the respondents who had not adhered to isoniazid preventive therapy were male. This may be attributed to the fact that male have poor health seeking behavior as compared to their female counterparts[4].

The results were contrary to a study done in rural Uganda which revealed that gender was strongly associated with IPT adherence among HIV positive patients who received differentiated and non-differentiated HIV care[11]. The results agreed with a cross-sectional analytical study done on IPT completion determinants in Dar es Salaam, Tanzania where gender was not significantly associated with completion of IPT[12].

The findings of this study showed that most of the respondents were married. This is probably because the respondents interviewed were more than 18 years hence most likely to be in stable marriages. The results

concur with studies done in Nigeria and Ethiopia where most of the respondents were married respectively[13 14]. There was a significant statistical association between marital status and adherence to isoniazid preventive therapy. This may be attributed to the fact that married couples could easily get psychosocial support from their partners who could encourage them to complete their IPT drugs as most married individuals adhered to isoniazid preventive therapy. The results were similar to a study done in Tanzania, where the marital status of being married was a significant predictor of IPT adherence[15].

Concerning the respondents age, majority of the respondents were aged between 28-37 years. This is a true reflection of the population of Kenya where majority of the population are youths with high prevalence of HIV/AIDS[16]. The results were similar to a study done in Addis Ababa where majority of the respondents interviewed on IPT completion and associate factors were aged between 28-37 years of age[17].The results were inconsistent with a study done in Northwest Ethiopia where it was reported that most of the respondents were aged between 18-30 years[18]. In another study done in southeast Nigeria majority of those who participated were aged between 30-49 years[13]. However, there was no significant statistical association between age and adherence to isoniazid preventive therapy. The results were contrary to a study done in Tanzania where age was a significant factor that influenced adherence to IPT among people living with HIV[12].

Regarding education, the results revealed that most of the respondents had secondary education as their highest level attained. The results were contrary to a study done in an urban health center in Kenya where majority of the respondents had a primary level of education[4]. In another study done in Ethiopia, inconsistent results were also reported with 68.2% of respondents having primary level of education[18]. There was a statistically significant association between highest level of education attained and adherence to isoniazid preventive therapy. Adherence to IPT increased with increase in educational level. This is because education enables people to access more information making them more knowledgeable on the consequences associated with poor compliance to drugs. The results were not in agreement with a systematic review which concluded that educational level was not associated with adherence with IPT[19]. According to a study done by[20], in their study, they concluded that HIV positive patients with primary level of education were least likely to adhere to IPT.

The study findings revealed that most of the respondents were self-employed. This may be because of high unemployment status among most sub-Saharan African countries resorting to start their own businesses. The results were consistent with a study done by[17] who revealed that self-employment was the main source of income among patients on IPT. Contrary results were reported by a study done in Nigeria where most of the respondents on IPT were employed[13]. There was a significant statistical association between occupational status and adherence to isoniazid preventive therapy among the respondents. Those who were self-employed were more likely to adhere to IPT. The results concur to studies done in Dar es Salaam, Tanzania and Kano, Nigeria where the occupational status was one of the predictors for acceptability and adherence to IPT uptake among HIV positive patients[21]. According to a study done in Nepal on IPT completion rates, it was reported that being a migrant worker was more likely to adhere to IPT completion[22].

Concerning the respondents' stage of HIV, results showed most of them were in stage 1. There was a significant statistical association between stage of HIV and adherence to isoniazid preventive therapy. This is because during the early stages, people tend to comply more with regimen due to fear of complications but as time goes by patients tend to drop out due to being overburdened by drugs. The results were contrary to a study by[18] on IPT adherence, who revealed that majority of the respondents were in stage 3. The results agreed with a study done in Brazil which showed that there was an association between WHO stage of HIV and adherence to IPT. This decreases with increase in HIV stage as those in stage 3 and 4 were

less likely to adhere to IPT[23] Consistent results were reported by a study done in rural Malawi where provision of IPT at the initial stages of HIV diagnosis was associated with high successful completion rates[24].

Further, the results revealed that majority of the respondents were in a walking functioning status. There was no significant statistical association between functional status and adherence to isoniazid preventive therapy. However, majority of those who were in walking functional status were more likely to adhere to IPT. The results were contrary to a study done by[25] who found out that functional status was associated with adherence to IPT among HIV positive patients. Clinically ill patients are more likely not to adhere to IPT due to difficulties among clinicians to rule out TB[26]

4.2 Adherence to IPT

The study sought to find out the proportion of respondents who adhered to IPT which was measured by determining those completing at least 90% of IPT in the last months dose among HIV positive patients. The results showed that the adherence level was at 72.2%.

However, the adherence level in this study was significantly lower than other studies done across the world. This could be because of stigmatization hence the differences in adherence levels across countries. The results were contrary to studies done in Malawi where the adherence level on IPT stood at 75%[24]; in Dar es Salaam Tanzania where the adherence level was 76%[12]; in South Africa where 86.8% of the HIV positive patients completed IPT with 11.3% permanently discontinued[10]. In another study in USA, high IPT completion rates of 87.2% were reported due to increased follow-ups from care providers[27].

The study findings also noted that the main reason for non-adherence to IPT among the respondents was being suspected to be having TB by health care provider. This is because IPT is meant to prevent development of active TB among HIV positive patients thus lower the cases of TB co-morbidities. Hence, once a HIV positive patient develops active TB, they are immediately withdrawn from IPT and managed with a different standard of care. The results were inconsistent with a study done in Africa where the main reason for non-adherence was due to side effects[10]. In another study done in Kenya, long treatment regimen/duration and fear of side effects was the key barrier to adherence to IPT[28]. In a study done in Zimbabwe, adverse drug reactions led stopping HIV positive patients from using IPT by healthcare providers[29]. INH shortage has also been noted as one of the factors that are associated with non-adherence to IPT among HIV positive patients in Ethiopia[30]

Finally, the researcher sought to enquire whether the respondents understood the role of IPT. The results showed that majority of the respondents indicated that the role of IPT was to treat TB. This means that they did not give the main reason for IPT treatment which prevents development of active TB among HIV positive patients. The results were similar to a study done in Nigeria where majority were not aware of isoniazid preventive therapy's role[13]. In another study done in Indonesia, majority of the respondents reported that IPT was important in preventing development of active TB in HIV positive patients[31].

4.3 Patient-provider interaction factors

The study sought to determine the patient-provider interaction and its influence on adherence to IPT. The results showed that most of the respondents rated the attitude of healthcare workers as being fair. The results were consistent with a study done on KAP on IPT in South Africa which showed that the attitude of healthcare workers was favorable[32]. There was a significant statistical association between perceived healthcare workers' attitude and adherence to isoniazid preventive therapy. This is because a good perceived attitude enables patients to follow instructions given to them by care providers and thus more likely to adhere to IPT. The results concur with a cross-sectional study on IPT uptake in Rwanda which showed that the attitude of healthcare workers significantly affected IPT adherence among HIV positive

patients[33]. In another study done in South Africa among IPT defaulters, it was concluded that nurses and care providers should control their attitude during interaction with their patients[34].

The study findings noted that less than a half of the respondents were of the view that there were enough healthcare workers to provide IPT services. Having enough workers means that patients are served fast reducing the waiting time and congestion. Similar results were reported by a study done by[35], on the provision of IPT among HIV positive patients in Mafikeng PHC facilities which showed that there were enough healthcare workers. The results were contrary to a study done in Arua District in Uganda where it was noted that the healthcare workers were not enough with frequent stock-out of drugs which affected HIV positive patients' adherence to IPT[36]. However, there was no significant statistical association between hospital having enough healthcare workers and adherence to isoniazid preventive therapy. When there are enough healthcare providers to offer counselling and support, HIV positive patients tend to adhere to IPT treatment[37].

Majority of the respondents agreed that healthcare workers provided them with adequate information on isoniazid preventive therapy. According to a study done in South Africa on barriers and facilitators of IPT adherence, it was noted that provision of information was key during provider-patient interaction as reported by majority of respondents[38]. There was significant statistical association between healthcare workers providing adequate information and adherence to isoniazid preventive therapy. Provision of information enables patients to get a clear understanding of the importance of completing drug dosages and the consequences associated with non-adherences. The results were consistent with a study done in selected clinics in Nairobi City in Kenya where the HIV positive patients on IPT were informed on their IPT status through follow ups using mobile phones which boosted their adherence rates[39].

The results of this study reported that time taken for isoniazid preventive therapy at the hospital was not effective as shown by majority of those interviewed. In a study done in Eswatini on completion of IPT, long travel and wait times was reported by most of the respondents[40]. Long waiting time and spending a lot of time in the hospital during service provision may discourage patients from seeking subsequent services in the health facilities. However, there was no statistical association between effectiveness of the time taken for IPT and adherence to isoniazid preventive therapy. The results were inconsistent with a study done in Indonesia where patients had to spend a lot of time waiting for medication which further affected their adherence to IPT[31]. In another study done in Uganda, contrary results were also reported where time for medication during IPT treatment was statistically significant related to IPT adherence among patients[41].

Further, the results report that the respondents had a better understanding of isoniazid preventive therapy. The results were not in agreement with a study done in South Africa on barriers and facilitators of IPT adherence where majority of the respondents had a poor understanding of the need for IPT provision[38]. In another study done in Nigeria, majority of the respondents had low understanding of IPT[13]. There was a significant statistical association between having a better understanding of IPT and its adherence among respondents. This is probably because they were given adequate information concerning the therapy including the consequences of not completing the treatment and its side effects. In a Zimbabwean study done among HIV positive patients, it was noted that patients initiated with good understanding on IPT have high adherence levels since they already knew its importance·

4.4 Socio-environmental factors

The study revealed that majority of the respondents agreed that sometimes there was stock out of drugs in the facility. There was a significant statistical association between occasional drug stock out and adherence to isoniazid preventive therapy. This is because the study was done in public health facilities which experience episodes of drug shortages thus affecting adherence to IPT among patients. The results were like a study done in Arua District in Uganda where it was noted that frequent stock-out of drugs

affected HIV positive patients' adherence to IPT[36]. In another study that was done in Zimbabwe, stock-out of drugs was a major barrier that significantly influenced adherence to IPT among patients[43]. In a study done in Karnataka in India, the main reason for non-completion of isoniazid preventive therapy was interruption of drug supplies in health facilities[44].

The results revealed most of the respondents neither agreed nor disagreed that the distance to the nearest health facility from their homes was far. This was because the study was done in an urban area in Nairobi where healthcare facilities are located not far away from one another due to high population density. The results were contrary to a study done in KwaZulu-Natal in South Africa which revealed that people in rural areas travel longer distances to seek healthcare services[45]. However, there was no significant statistical association between distance to the facility being and adherence to isoniazid preventive therapy. The results were similar to other studies which associated distance to the nearest health facility and adherence to IPT among HIV positive patients[46] . Those closer to the nearest health facility are more likely to complete their IPT regimen compared to those away from health facilities[33].

Majority of the respondents reported that their family and friends were always there to support them while they were under IPT. Provision of psycho-social support especially to patients with long-term illnesses is key to compliance to medication. The results were inconsistent with a study done in Southern Ethiopia where it was reported that only thirty percent of the HIV positive patients seeking IPT treatment felt they got social support from family and friends[47] . There was a statistically significant association between family and friends being always there to support and adherence to isoniazid preventive therapy. They feel comforted by people who are close to them thus encouraged to take treatment positively. The results agreed with a study done by[48] which reported that lack of support from family members was one of the challenges that hindered HIV patients from completing their IPT dosages. In another study done in rural Uganda, non-completion of IPT treatment among HIV patients was significantly associated with lack of adequate support from friends and family members[11].

Further, the results revealed most of the respondents did not feel afraid to seek permission from the employer in order to go for IPT treatment. The results were contrary to a study done among adolescents and adults HIV patients in resource constrained settings which showed that they feared to seek permission to attend IPT treatment[49]. There was a significant statistical association between feeling afraid to seek for permission from the employer to go for IPT treatment and adherence to isoniazid preventive therapy. This is because HIV policies have been incorporated in all organizations to prevent stigma and discrimination among HIV positive workers thus creating an enabling environment for them to seek medical care from respective facilities.

5.0 Conclusions and Recommendations

Conclusions: In conclusion, the study found that most patient-provider interaction factors were associated with adherence to isoniazid preventive therapy. They are attitude of healthcare workers, provision of health information and understanding of isoniazid preventive therapy. The IPT adherence rate among HIV positive patients in Nairobi City County was fair. The main reason for non-completion of IPT was suspected active TB by healthcare providers.The study also revealed that most of the patient-related factors were significantly associated with isoniazid preventive therapy in Nairobi City County. They include persuasion to complete IPT, fear of INH safety, existence of cultural beliefs and beliefs in IPT treatment. Finally, the study concludes that most socio-environmental factors were associated with adherence to isoniazid preventive therapy among HIV positive patients in Nairobi City County. They are frequent stock-out of drugs, social support from family and friends and afraid to seek permission from employer.

Recommendations

The study recommends the following based on the findings of the study:

a) The County government of Nairobi City and respective facilities should scale up continues medical education training on IPT to improve healthcare workers' attitude and disseminate relevant information thus leading to higher adherence levels among HIV positive patients.

b) The study recommends that the county government of Nairobi together with the healthcare facilities providing IPT should scale up sensitization programs among people living with HIV to dispel myths and misconception about HIV/AIDS thus improved adherence levels on IPT.

c) The Ministry of Health, the County government of Nairobi and respective facilities should ensure well stocked IPT drugs to ensure they are readily available for use among people HIV positive patients thus increased adherence level towards IPT.

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