Isoniazid preventive therapy utilization rate and associated factors in adult HIV/AIDS patients in Jimma University Specialized Hospital ART clinic: A cross-sectional study.

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Abstract

Background: Tuberculosis (TB) is the most frequent life-threatening infection and a common cause of death for people living with HIV (PLHIV). The influence of TB and HIV infection has enhanced the magnitude of both epidemics. IPT is one of the several key interventions recommended by the world health organization (WHO) for the prevention of TB in patients infected with HIV. Hence, the present study aimed to determine the IPT utilization rate and to explore the determinant factors among PLHIV under follow-up, Health care providers (HCP’s) and TB/HIV coordinators working in Jimma University Specialized Hospital (JUSH) ART clinic, Ethiopia. Methods: An Institution based cross-sectional study was conducted in JUSH ART clinic, Oromia region, Ethiopia. The target groups were enrolled by a systematic sampling technique from the registered medical records of JUSH HIV care. Semi-structured questioners and in-depth interviews were designed for quantitative analysis from PLHIV, HCP’s and TB/HIV coordinators working in JUSH, ART clinic. All statistical analysis was compiled by Epi data 3.1 and SPSS 20. Results: The overall estimated IPT utilization rate in JUSH ART clinic was 59.2%. Demographic and clinical factors are not significant, but ethnicity was highly significant with IPT use in PLHIV. All respondents, HCP’s and TB/HIV coordinators were interviewed on identifying the factors and barriers that increase the utilization of IPT. The results of in-depth interviews are grouped into three core categories as patient perceptions, HCP’s and TB/HIV coordinator perspectives. Discussion and conclusion: PLHIV, HCP’s and TB/HIV coordinators suggested their overall response as periodic counseling for target groups, educating the benefits of IPT and increasing public awareness on TB prophylaxis in PLHIV. Higher attention should be provided in linking all HIV patients to the nearest health facilities for receiving free service packages and medical care. Administrative managers could improve the capacity building by increasing the number of
health care professionals, maintaining data base on patient records and continuous supply of pyridoxine and IPT for all PLHIV. HCP’s and TB/HIV coordinators responded that disclosure to the patient families and occupational independence will increase the acceptance and implementation of IPT in large scale.

Background

TB and Human Immunodeficiency Virus (HIV) are the two opportunistic infections that cause high morbidity and mortality in the world [1]. HIV infection is one of the greatest risk factors in developing TB disease. PLHIV are at least 26 times more likely to develop TB disease than people without HIV [2]. HIV suppresses the immune system by reducing CD4 count and increases the risk of developing TB infection among PLHIV. Therefore, prevention of TB is one of the most important measures needed to reduce morbidity and mortality among PLHIV, especially in countries with a high TB and HIV burden. Ethiopia is one of the 22 high TB burden countries ranking 9th in the world and 3rd in Africa with the prevalence of TB burden was estimated at 261 and 394 per 100,000 populations, respectively[3, 4]. According to WHO report the rate of TB patients who were found to be co-infected with HIV in Ethiopia was between 10% and 15% and nearly 88% of TB patients who were co-infected with HIV were placed on ART [5]. Multiple strategies are existing in the prevention of TB disease such intensified case finding (ICF), isoniazid preventive therapy (IPT) and TB infection control (IC), along with ART [6]. Earlier research reports recommend the use of IPT with ART in reducing the burden of TB among PLHIV [7, 8, 9]. WHO strongly recommends providing at least 6 months of IPT for PLHIV without active TB, including those receiving ART and those who have successfully completed TB treatment conditionally recommends providing isoniazid for 36 months for PLHIV [10, 11, 12]. Earlier research findings emphasised various factors that hinder the implementation of IPT such as complexities observed in organizing national and regional TB / HIV programs, lack of
confidence on IPT, fear on drug resistance and pill burden. Moreover, lack of counselling for target groups, work burden, fear of stigma, lack of money for travelling long distance to the health centres, prolonged waiting time for investigation and misinformation about IPT are some of the highlighted factors that inhibit the utilization of IPT among PLHIV [13, 14]. In controversy, a pilot study conducted in Vietnam among HIV infected patients reported that acceptability and completion rate was high (80%; 91.8%) and no adverse effects were reported on IPT use [15]. A research study done in sub-Saharan Africa recommended that IPT can be prescribed safely during the early course of HIV disease [16]. Therefore, determining the IPT use and suggestions to improve IPT implementation in representative population increases the strength of further TB/HIV programs conducted on large scale.

**Objectives**

To determine IPT utilization rate and determinant factors among adult HIV infected patients at JUSH ART clinic, Oromia region, Ethiopia.

**Specific Objectives**

To determine the IPT utilization rate among adult HIV infected patients enrolled in HIV Care at JUSH ART clinic.

To describe the factors that influence IPT use among adult HIV cases from PLHIV, HCPs and TB/HIV coordinators.

**Methods**

**Study Setting and design**

An Institution based cross-sectional study was conducted on 1\textsuperscript{st} May 2016 – 30 June 2016 in JUSH HIV care, Oromia region, JUSH is located in Jimma town, which provides health service for 15 million people in South West of the country. It has one ART clinic launched
in 1998 and the total number of PLHIV enrolled in this clinic was 7690. One thousand (1000) patients have stopped ART regimen. There were 6690 HIV-infected people under follow up in the ART clinic in May 2016.

**IPT program in Ethiopia**

IPT implementation was initiated in 2008 in Ethiopia. Our government recognized the burden of TB/HIV confection and implemented the therapeutic guidelines in national TB – strategic plan 2011 – 2015. According to its policy, all PLHIV should be screened for TB using WHO four symptoms (current cough, fever, night sweats or weight loss) based screening. The eligible screened patients without active TB will be prescribed with IPT for 6 months. The National target for IPT initiation for eligible PLHIV is 100%.

**Study population**

Patients enrolled in HIV care at the age of 15 – 68 years who were eligible for IPT, HCP’S working in ART clinic and TB/HIV coordinators in JUSH are included in the research investigation.

**Inclusion criteria for Participants**

HIV infected patients enrolled in the ART clinic during our study period were screened through medical records and included the patients who are using IPT.

PLHIV under follow up programme, HCP’S and TB /HIV coordinators willing to participate in the assessment of IPT associated factors and in-depth interviews are included as our study participants.

**Exclusion criteria**

Patients whose symptoms are positive in TB screening, identification of active TB, acute/chronic hepatitis, alcoholics, peripheral neuropathy, prior allergy or intolerance to isoniazid excluded in the analysis.
Sampling method

The sample size was calculated by single population proportion formula $n = \frac{Z_{\alpha}}{2} \cdot p \cdot (1 - p) / d^2$ using ($p=22\%$; 95\% CI and 5\% precision) the prevalence of IPT use in HIV-infected patients in ART clinic, Black lion hospital, Addis Ababa [14, 17]. The calculated sample size was 264 and with 10\% s expected loss and non-response rate, the final sample size was 290. Our respondents were selected by systematic sampling technique with every study subjects are at the 24th interval in the sampling frame and the initial respondent being the first patient in HIV care. We excluded 9 patients who had active TB disease, and 2 had a history of chronic alcoholism for which we recruited an additional 11 patients to reach our sample size. We considered IPT as dependent variable and knowledge, education, occupation, residence, disclosure of HIV status, pill burden, Level of CD4, WHO clinical stages, nutritional status, alcohol use and comorbidity as independent variables. We used convenient sampling technique for semi-structured questioners and in-depth interviews from the patients who were included in the study (from both those who took IPT and those who did not take IPT) and have a visit to the ART clinic during the study time, health care workers at TB/HIV clinics and TB/HIV program managers working in JUSH, ART clinic. The questioners are developed according to standard WHO 6 health system frames [18], and in-depth interviews were used till saturation of ideas/ responses have occurred. The core ideas originated as barriers and factors that increase the IPT implementation are grouped into three categories as patient-related factors, HCP’s and TB/HIV coordinator perspectives. All questionnaires were pre-coded and target group interviews were audio recorded and cross-checked for completeness prior to computation.

Definition of variables

IPT users/utilizers: PLHIV who are initiated on INH (isoniazid) 300mg daily as IPT and who
are either taking during data collection or whose status after initiation is known or unknown.

Previous TB treatment: patients who took the standard anti-TB drugs for ≥ 1 months and not taking the drugs during the study time despite the treatment outcomes

Adult PLHIV: defined as PLHIV whose age ≥ 15 years as this cut of age is used for classification of adult and pediatric clinics in JUSH and other governmental hospitals in Ethiopia.

Ethical Consideration

Ethical clearance was acquired from Institutional Review Board (IRB) of the College of Health science and Ethical review committee of JUSH (Ref. No: RPGC/14/2016). As per HIV programme protocols, the resident Physicians are permitted to collect the data for evaluating the strength and weakness of the program and to do research. Written consent was obtained from each subject and passive parental consent from the parent (or) guardian was received for the patients < 18 years. All interview script was coded, and none of the patient identifiers as included in data assessment.

Statistical analysis

Descriptive statistics and bivariate analysis were done to sort variables for logistic regressions having value P ≤ 0.25. The stepwise multivariate regression model was used with P < 0.05 as significant for the dependent variable. Qualitative data for IPT utilization and associated factors from patients, HCP’s and TB/HIV coordinators were presented based on their categories. The data are coded by Epi data 3.1 and analyzed by SPSS 20.

Results

The present study includes quantitative and qualitative data’s collected from medical records, and respondents including PLHIV, HCP’s and TB/HIV coordinators in JUSH ART
clinic, Ethiopia. Table - 1 represents demographic information including sex, age, marital status, education, ethnicity, religion, occupation and residence of PLHIV. The average age of the target group was 35.2 ± 9 and sex ratio constitutes 40.8 % of males and 59.2% of females. Nearly 19% are single; 45.6% of the study population is married; 16.3% are divorced, and 19% of the remaining groups are separated/widowed. Regarding education, 16% of respondents had no formal education; 2.7% are able to read and write; 64.6% of target groups completed grade - 12 and 16.3% had completed the university education. Oromo ethnic group constitutes 51.7%, Amhara (12.2%), SNNP (27.2%), Tigre (3%) and others 6.8%. Nearly 59.2% of the study participants are Orthodox Christians, 12.2% are protestant Christians; 24.5% are Muslims, and 4.1% are other groups. Almost 22.4% of the respondents are government employees; 10.2% are merchants; 6.1% of the target groups are farmers; 55.8% are housewives, and 51% are students. 77.6 percent of the study populations are from the urban area, and 22.4% of patient resides in the rural sector.

Table -2 represents the average association of all variables grouped from medical records with dependent variable IPT use. Average demographic data's of sex (1.62), age (2.55), marital status (2.48), education(3.45), religion (1.71), ethnicity (2.07) occupation(3.08) and residence (1.17) of PLHIV were presented in table - 2. Clinical data including BMI (1.17), WHO Clinical stages (2.64), duration of HIV care (2.3), types of HIV care (1.70), opportunistic infections (1.01), duration of HAART care (1.6), types of HAART care (1.9), CD4 count (1.70) and previous TB treatment (0.21) with their respective 95%CI were presented in table - 2. With regard to IPT use, 53.4% of the patients have been prescribed and taken at least one-month IPT while 36.8% have not been prescribed while in 9.8% of the patients the status of IPT was unknown. The overall IPT utilization rate among PLHIV is 59.2% in JUSH ART Ethiopia (Figure - 1).

Crude Odd’s ratio of IPT associated variables including age (OR: 1.02), ethnicity (OR:
place of residence (OR: 2.06), types of HIV care (OR: 0.22), duration of HIV (OR: 1.08) and HAART care (OR: 1.05), previous TB (OR: 1.74), CD4 count (OR: 0.53) and baseline hemoglobin (OR: 1.12) levels are presented in Table 3.

In the logistic regression model, Oromo and Amhara ethnic groups were more likely to use IPT than SNNP groups (for Oromo ethnicity, P ≤ 0.03 and Amhara, P ≤ 0.025) and other variables like age, occupation, residence, type of HIV care and its duration, previous TB, CD4 count and hemoglobin were not found to be statistically significant with IPT (Table - 4).

In conducting semi-structured questioners and in-depth interviews 60% of respondents are females and 40% are males with mean age of 33± 4. Around 40% of HCP’s working JUSH were included in the in-depth interviews which comprises 20% nurses (age: 27 ± 5.7) and 20% ART physicians (age: 26 ± 1.7) respectively. Average service days of HCP’s were 92 ± 3.1 for nurses and 36 ± 3.2 for ART physicians. Nearly 10% of participants are TB/HIV coordinators (age: 41 ± 3.5), and their mean working experience was about 20 years in JUSH.

One way analysis of variance (ANOVA) between IPT and non IPT users together with sex (0.229), age (0.533), marital status (0.137), education (0.064), residence (0.061), monthly income (1.164), counseling given (0.239), disclosure of HIV status (4.814), CD4 count (0.538), previous TB treatment (0.228), pill burden for HAART (0.224) and Co-trimoxazole (0.235) were presented in Table – 5. The overall estimated IPT utilization rate in JUSH ART clinic was 59.2%. All respondents included in the qualitative study, PLHIV, HCP’s and TB/HIV coordinators responded the core ideas and solutions in identifying factors which increases the IPT implementation. Conceptual results are presented in three core categories as patient perceptions, HCP’s and TB/HIV coordinator perspectives.

Discussion
The present research aimed to define the IPT utilization rate and to identify the factors influence use among PLHIV, HCP’s and TB/HIV TB/HIV coordinators in JUSH ART clinic, Ethiopia. The overall IPT utilization rate among patients enrolled in ART clinic was 59.2%. Our findings are 3 -4 fold increase in IPT implementation compared with 30% implementation in Addis Ababa[19, 20] 19.6% in Northern Ethiopia [21].

Our results are in accordance with other studies that recommended IPT use in combination with ART could effectively reduce TB risk in HIV-infected adults.[16, 22, 23] also recommended that IPT in combination with ART were effective in reducing TB risk in HIV-infected adults.

According to TB/HIV surveillance annual report, nearly 18.2% of HIV patients with no clinical symptoms of TB received IPT which varied by 5.6% in SNNP, 16% in Oromia and 55.9% in Harari regions respectively [17]. However, the government intention is to reach the target goal as 100% in HIV care users.

We investigated the demographic and clinical factors associated with IPT use in PLHIV. Accordingly, age, occupation, educational level and residence were not found to be statistically significant with IPT use. Our findings are supported by earlier reports that age and sex had no significant association with IPT [24]; the only ethnicity was statistically significant with IPT use. Oromo and Amhara ethnics are 3.6 and 8.8 folds more likely to use IPT when compared to SNNP group (Oromo: P< 031; Amhara: P<025). However, there were no quantitative studies done to evaluate the ethnic effect on IPT use.

We also evaluated the factors that determine IPT use from PLHIV, HCP’s and TB/HIV coordinators’ perspectives. PLHIV who have not used IPT were interviewed to mention the reasons or barriers that made them not use IPT and they responded as lack of awareness, no proper counselling about the benefits of IPT, unwillingness to disclose the disease, pill burden, misinformation and fear of side effects. Almost 89% of HIV patients reported that
counselling was beneficial by adhering to HIV treatment and to change their perception about the disease. They further responded that counselling motivate them to live a planned life. Nearly 60% of patients supported that disclosure was important which helped them to protect from infections and to have safer sex with their partners and knowing their health status will at least help them not to have sex with them. In controversy, 40% of respondents argued that disclosure to other family members would result in stigma and discrimination in rural areas. All participants agreed that an increase in CD4 count and medications would prolong their life and protect them from TB/HIV disease. 35% of patients mentioned that they are fearful about the adverse effect of the drug and resistant capacity despite they believed that taking more medications are not good for their body. The group of IPT users mentioned the factors that motivated are counselling, fear of death from TB disease, concern for their family; maintain routine daily life and the trust that IPT can cure their disease. Some of the major constraints observed in non-IPT users are lack of counselling and awareness on IPT, unwillingness to disclose their disease, pill burden, misinformation and fear of side effects. Our findings are similar in previous studies done in Tanzania, Northern Thailand, South Africa and Addis Ababa [25, 26, 27, 18].

HCPs responded that implementation of IPT is one of the effective ways to prevent TB in PLHIV and they are a volunteer to prescribe for all eligible individuals with HIV. They underlined IPT completion rate was very high and side effects are rare because it was given with pyridoxine for all patients. The positive attitude of HCP’s observed in our study was supported by a report stated that IPT use without active TB was 42% in Oromia Region [28, 29]. They highlighted some major barriers as lack of knowledge among the respondents on adverse effect of TB and the benefits of IPT, fear on drug toxicity, pill burden and misinformation about IPT use. HCPs' suggested their solution to improve IPT
implementation by increasing public awareness through health education, regular counseling, launching advanced TB screening techniques and increasing sufficient number of HCP’s at ART clinics.

TB/HIV coordinators of JUSH ART clinic responded that IPT implementation was monthly monitored by HIV coordinators and every quarterly period by CDC focal person which is further supervised by Oromia regional and National Health Bureau representatives. TB/HIV coordinators responded that their ultimate target was to achieve the highest implementation of IPT. Coordinators also replied that some patients refuse to use IPT and such patients are rigorously counseled for their active participation in the utilization of IPT. The overall responses from PLHIV, HCP’s and TB/HIV program managers indicated the possibility of escalating IPT by periodic counseling, increasing the number of health care professionals and educating the safety aspects of IPT for PLHIV. Higher attention should be given on TB prophylaxis; linking patients in rural areas to the nearest health facilities in association with community based organization for effective health care. Higher priority in delivering free service packages for PLHIV, increasing continuous supply of Pyridoxine with IPT and initiating computerized patient records are the core strategies responded by HCP’s in implementation of IPT. Nearly 45% of HCP’s and TB/HIV coordinators reacted that disclosure to the patient families and occupational independence will increase the acceptance and implementation of IPT in large scale.

**Strength and Limitations of the study**

Our finding is one of the fewer studies conducted in a clinical care setting where patient management protocols are standardized and executed in practice. This is the first study in Oromia region integrating the perspectives and implementation of IPT among PLHIV, HCP’s
and TB/HIV coordinators. So, the findings of our study could be used as a baseline for scale-up program in the community level and stake holder’s extension packages. Our limitations are relatively small sample size, and we adapted the existing facilities because of resource limitation. Our only sampling site is JUSH, ART clinic which may limit the generalizability of our findings to other regions of Ethiopia. However, our results serve as a pilot trial to focus our upcoming research on finding innovative medical approaches and quantifying the effect of IPT to control TB in PLHIV.

**Conclusion And Recommendation**

The overall IPT utilization rate among patients enrolled in HIV care was 59.2%. The demographic and clinical factors are not significant, and ethnicity is highly significant with IPT use in PLHIV. The Qualitative study responses of PLHIV, HCP’s and TB/HIV coordinators in escalating IPT use among PLHIV are periodic counseling, increasing the awareness on TB prophylaxis and educating the benefits of IPT for PLHIV, linking HIV patients to the nearest health facilities in association with community based organization for HIV care, delivering free service packages for target groups, increasing the number of health care professionals, maintaining computerized patient records and constant supply of Pyridoxine and IPT.

The Ethiopian government had framed systematic methods in IPT implementation and developed feasible policy in monitoring and evaluating TB/HIV patients. HIV case registered information and IPT provision can be assessed from the guidelines provided for ART clinics, Ethiopia. In addition, IPT registers could also be used to monitor IPT initiation, adherence, and any adverse events during treatment. Health care providers need to monitor the reporting systems and support the PLHIV through structured counseling, developing health education programs on IPT and to provide IPT with pyridoxine in stipulated time to reach the optimum goal in IPT utilization in the country.
Declarations

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Availability of data and materials

All the data’s collected and used in the current research document was obtainable from the corresponding author.

Authors’ contributions

GI has designed the research, collected the data and conducted the analysis. VR drafted and reviewed the manuscript. KW engaged in guidance and data acquisition.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1: Socio-demographic figures of PLHIV in JUSH ART Clinic, Ethiopia
| Variables           | Category          | N%    |
|---------------------|-------------------|-------|
| Sex                 | Male              | 60 (40.8) |
|                     | Female            | 87 (59.2) |
| Age                 | < 35              | 75 (51.0) |
|                     | > 35              | 72 (49%) |
| Marital status      | Married           | 67 (45.6) |
|                     | Single            | 28 (19) |
|                     | Divorced          | 24 (16.3) |
|                     | Widowed /Separated| 28 (19.0%) |
| Education           | No formal education| 24 (16.3) |
|                     | Know to read and write | 4 (2.7) |
|                     | completed ≤ grade - 12 | 95 (64.6) |
|                     | Completed UG degree| 24 (16.3) |
| Ethnicity           | Oromo             | 76 (51.7) |
|                     | Amhara            | 18 (12.2) |
|                     | SNNP              | 40 (27.2) |
|                     | Tigre             | 3 (2.0) |
|                     | Others            | 10 (6.8) |
| Religion            | Orthodox          | 87 (59.2) |
|                     | Protestant        | 18 (12.2) |
|                     | Muslim            | 36 (24.5) |
|                     | Others            | 6 (4.1) |
| Occupation          | Government employee| 33 (22.4) |
|                     | Merchant          | 15 (10.2) |
|                     | Farmer            | 9 (6.1) |
|                     | House wife        | 82 (55.8) |
|                     | Student           | 8 (5.4) |
| Residence           | Urban             | 114 (77.6) |
|                     | Rural             | 33 (22.4) |

Note: N = Number of Respondents

**SNNP = Southern Nations, Nationalities and Peoples, which comprises many different ethnicities.**

Table - 2: Baseline and clinical information perceived from medical records on PLHIV in JUSH ART clinic, Ethiopia
|                          | Mean ± SD      | t - test | mean difference 95% CI       |
|--------------------------|----------------|----------|-----------------------------|
| Sex                      | 1.62 ± 0.5     | 0.853    | 0.07 (-0.09, 0.2)           |
| Age                      | 2.55 ± 0.9     | 1.326    | 0.2 (-0.09, 0.5)            |
| Marital status           | 2.48 ± 1.2     | 0.078    | 0.02 (-0.4, 0.4)            |
| Education                | 3.45 ± 1.2     | 0.617    | 0.1 (-0.3, 0.6)             |
| Religion                 | 1.71 ± 1.0     | -0.332   | -0.05 (-0.4, 0.3)           |
| Ethnicity                | 2.07 ± 1.5     | 0.156    | 0.04 (-0.4, 0.5)            |
| Occupation               | 3.08 ± 1.3     | -0.385   | -0.09 (-0.3, -0.01)         |
| Residence                | 1.17 ± 0.4     | -1.831   | -0.1 (-1, 0.08)             |
| BMI                      | 2.64 ± 1.6     | -1.69    | -0.5 (-0.1, 0.01)           |
| WHO Clinical stages      | 2.3 ± 1.1      | -1.58    | -0.3 (-0.01, 0.4)           |
| Duration of HIV care     | 1.7 ± 0.6      | 1.969    | 0.2 (-0.09, 0.02)           |
| Types of HIV care        | 1.01 ± 0.1     | -1.41    | -0.4 (-0.3, 1.1)            |
| Types of opportunistic infections | 4.6 ± 2.0 | 1.13 | 0.4 (-0.06, 0.3)          |
| Duration of HAART care   | 1.6 ± 0.6      | 1.372    | 0.1 (-0.6, 0.04)            |
| Types of HAART care      | 1.9 ± 0.9      | -1.724   | -0.3 (-0.1, 0.4)            |
| CD4 count                | 1.70 ± 0.6     | 1.492    | 0.2 (-0.2, 0.1)             |
| Previous TB treatment    | 0.21 ± 0.4     | -1.289   | -0.1 (-0.2, 0.1)            |
| Patients screened for IPT| 0.76 ± 0.4     | 0.788    | 0.1 (0.1, 0.2)              |
| Types of screening methods| 1.94 ± 1.3    | 1.268    | 0.3 (-0.2, 1.0)             |
| IPT given                | 1.0 ± 0.2      | 23.96    | 0.9 (0.8, 1.0)              |
| Co-morbidity             | 0.13 ± 0.3     | -0.407   | -0.02 (-0.1, 0.09)          |
| Patients taking medication| Co-trimaxole  | 0.79 ± 0.4| -0.351                   | -0.02 (-0.2, 0.1) |
|                         | Fluconazole    | 0.03 ± 0.2| -1.282                   | -0.5 (-0.1, 0.03) |
|                         | Other medications > 1 month | 0.17 ± 0.4 | 2.248 | 0.1 (0.02, 0.2) |
| Patients taking special medication | RUTF | 0.30 ± 0.8 | 0.684 | 0.1 (-0.2, 0.3) |
| Liver function test      | SGOT           | 0.28 ± 0.5 | -0.316 | -0.02 (-0.2, 0.1) |
|                         | SGPT           | 0.25 ± 0.5 | -0.099 | -0.07 (-0.2, 0.1) |
|                         | Total bilirubin| 0.01 ± 0.1 | -0.917 | -0.02 (-0.1, 0.1) |
| Kidney function test     | Blood urea nitrogen | 0.26 ± 0.4 | 0.423 | 0.03 (-0.11, 1.8) |
|                         | Blood Creatinine | 0.3 ± 0.5 | -0.015 | -0.01 (-0.15, 0.15) |
| Hemoglobin               | 0.8 ± 0.4      | -0.359   | -0.02 (-1.46, 0.10)         |
| Hepatitis B virus surface antigen | 0.15 ± 0.4 | 1.199 | 0.07 (-0.43, 0.18) |
| Variables          | Category                   | COR (95%CI)     | df | P - value |
|--------------------|----------------------------|-----------------|----|-----------|
| Age                | < 35                       | 1.02 (1.0 - 1.1)| 1  | 0.208     |
|                    | ≥ 35                       | 1               |    |           |
| Sex                | Male                       | 0.75 (0.34 - 1.5)| 1  | 0.392     |
|                    | Female                     | 1               |    |           |
| Marital status     | Married                    | 1.64 (0.7 - 4.1)| 3  | 0.285     |
|                    | Single                     | 0.65 (0.23 - 1.9)| 1  | 0.423     |
|                    | Divorced                   | 0.75 (0.3 - 2.2)|   | 0.607     |
|                    | Widowed / Separated        | 1               |    |           |
| Ethnicity          | Oromo                      | 2.38 (1.1 - 5.5)| 2  | 0.027     |
|                    | Amhara                     | 3.82 (1.2 - 12.7)|   | 0.029     |
|                    | SNNP                       | 1               |    |           |
| Occupation         | Farmer                     | 0.30 (0.1 - 1.3)| 4  | 0.109     |
|                    | Employed                   | 0.94 (0.4 - 2.1)|   | 0.874     |
|                    | Merchant                   | 1.22 (0.4 - 3.9)|   | 0.742     |
|                    | Students                   | 0.37 (0.1 - 1.6)|   | 0.187     |
|                    | Housewife                  | 1               |    |           |
| Education          | Uneducated                 | 0.75 (0.3 - 1.7)| 1  | 0.503     |
|                    | Educated                   | 1               |    |           |
| Religion           | Orthodox                   | 1.49 (0.3 - 7.9)| 3  | 0.64      |
|                    | Muslim                     | 1.4 (0.25 - 7.9)|   | 0.703     |
|                    | Protestant                 | 1.6 (0.25 - 10.1)|   | 0.634     |
|                    | Others                     | 1               |    |           |
| Residence          | Urban                      | 2.06 (0.9 - 4.5)| 1  | 0.071     |
|                    | Rural                      | 1               |    |           |
| BMI                | <18.5                      | 1.5 (0.3 - 7.9)| 2  | 0.663     |
|                    | 18.5-24.8                  | 1.26 (0.3 - 6.2)|   | 0.774     |
|                    | ≥25                        | 1               |    |           |
| WHO stages         | I                          | 1.75 (0.7 - 4.7)| 3  | 0.265     |
|                    | II                         | 1.47 (0.5 - 4.2)|   | 0.461     |
|                    | III                        | 0.81 (0.3 - 2.1)|   | 0.663     |
|                    | IV                         | 1               |    |           |
| Type of HIV care   | Pre-ART care               | 0.22 (0.02 - 2.2)| 1  | 0.196     |
|                    | HAART care                 | 1               |    |           |
| Variable                        | < 6 years | ≥ 6 years | β   |
|--------------------------------|-----------|-----------|-----|
| HIV care duration              | 1.08 (1.0 - 1.2) | 1         | 0.186 |
| HAART care duration            | 1.05 (1.0 - 1.2) | 1         | 0.357 |
| Previous TB                    | 1.74 (0.8 - 3.7) | 1         | 0.157 |
| CD4 count                      | 0.53 (0.17 - 1.7) | 2         | 0.241 |
| Comorbidity                    | 1.22 (0.5 - 3.2) | 1         | 0.682 |
| Co-trimoxazole:                | 1.16 (0.5 - 2.7) | 1         | 0.724 |
| Baseline Hemoglobin            | 1.12 (0.9 - 1.3) | 1         | 0.216 |

Note: df = degrees of freedom

Table - 4: Logistic Regression analysis on variables associated with IPT use among PLHIV at JUSH ART clinic, Ethiopia.
| Variables                  | Category | AOR (95% CI range) | df | P value |
|----------------------------|----------|--------------------|----|---------|
| Age                        | < 35     | 1.05 (1.0 - 1.1)   | 1  | 0.097   |
|                           | ≥ 35     | 1                  |    |         |
| Ethnicity                  | Oromo    | 3.37 (1.1 - 11.4)  | 2  | 0.031 * |
|                           | Amhara   | 8.81 (5.3 - 58.7)  |    | 0.025*  |
|                           | SNNP     | 1                  |    |         |
| Occupation                 | Farmer   | 0.16 (0.02 - 1.4)  | 4  | 0.099   |
|                           | Employed | 0.74 (0.2 - 2.4)   |    | 0.618   |
|                           | Merchant | 0.71 (0.2 - 3.4)   |    | 0.662   |
|                           | Students | 0.89 (0.2 - 5.3)   |    | 0.898   |
|                           | Housewife| 1                  |    |         |
| Residence                  | Urban    | 2.37 (0.7 - 7.8)   | 1  | 0.152   |
|                           | Rural    | 1                  |    |         |
| Type of HIV care           | Pre-ART care | 0.06 (0.003 - 1.3) | 1 | 0.072   |
|                           | ART care | 1                  |    |         |
| HIV care duration          | < 6 years| 1.13 (1.0 - 1.3)   | 1  | 0.151   |
|                           | ≥ 6 years| 1                  |    |         |
| Previous TB                | No       | 1.32 (0.5 - 3.9)   | 1  | 0.61    |
|                           | Yes      | 1                  |    |         |
| CD4 count                  | < 200    | 0.16 (0.02 - 1.2)  | 2  | 0.07    |
|                           | 200-499  | 0.28 (0.04 - 2.1)  |    | 0.216   |
|                           | ≥ 500    | 1                  |    |         |
| Baseline Hemoglobin        | No       | 1.18 (1.0 - 1.5)   | 1  | 0.13    |
|                           | Yes      | 1                  |    |         |

Note: df = degrees of freedom, *P < 0.05 is statistically significant

Table - 5: Analysis of variance between IPT and Non IPT users among PLHIV at JUSH ART clinic, Ethiopia
| Variable                  | IPT users   | 95%CI          | Non IPT users | 95%CI          | df   | F - value |
|--------------------------|-------------|----------------|---------------|----------------|------|-----------|
| Sex                      | 0.50 ± 0.6  | (-0.2, 0.9)    | 0.33 ± 0.5    | (-0.42, 1.4)   | 1    | 0.229     |
| Age                      | 0.54 ± 0.2  | (-0.1, 1.1)    | 0.51 ± 0.3    | (-0.1, 1.6)    | 1    | 0.533     |
| Marital status           | 1.4 ± 1.1   | (-0.2, 2.2)    | 0.75 ± 1.0    | (-0.8, 2.3)    | 1    | 0.137     |
| Education level          | 0.67 ± 0.5  | (0.1, 1.2)     | 0.71 ± 0.5    | (-0.2, 1.6)    | 1    | 0.064     |
| Residence                | 0.62 ± 0.4  | (0.1, 1.1)     | 0.73 ± 0.5    | (-0.1, 1.8)    | 1    | 0.061     |
| Monthly income           | 0.83 ± 0.4  | (0.4, 1.3)     | 0.53 ± 0.6    | (-0.4, 1.4)    | 1    | 1.164     |
| Counseling given         | 0.63 ± 0.5  | (0.1, 1.4)     | 0.51 ± 0.6    | (-0.3, 1.1)    | 1    | 0.239     |
| Disclosure status        | 1.3 ± 0.2   | (0.7, 1.1)     | 0.8 ± 0.6     | (-0.4, 1.2)    | 1    | 4.814     |
| CD4 count                | 0.55 ± 0.2  | (-0.07, 1.1)   | 0.49 ± 0.3    | (-0.1, 1.6)    | 1    | 0.538     |
| Previous TB treatment    | 0.33 ± 0.4  | (-0.2, 0.8)    | 0.54 ± 0.6    | (-0.4, 1.4)    | 1    | 0.228     |
| Patient treated with HAART | 0.67 ± 0.2 | (-0.1, 1.2)    | 0.51 ± 0.3    | (-0.5, 1.3)    | 1    | 0.224     |
| Patient treated with Co-trimoxaole | 0.32 ± 0.5 | (-0.2, 0.4)    | 0.54 ± 0.4    | (-0.5, 1.9)    | 1    | 0.235     |

Figures
Figure 1

IPT Utilization Rate among PLHIV at JUSH ART clinic

Supplementary Files

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