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Early View

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Latent tuberculosis screening and treatment in HIV: highly acceptable in a prospective cohort study

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Summary of the "take-home" message

Detailed exploration of the views of people living with HIV in the UK through a prospective questionnaire cohort study is the first of its kind in the published literature, and shows that latent TB screening and treatment is overwhelmingly supported.

Abstract

Background: People living with HIV (PLWH) are at increased risk of reactivation of latent TB infection (LTBI). Although UK and international guidelines identify this group as a priority for LTBI screening and treatment, data on attitudes of PLWH to this policy recommendation are lacking.

Methods: A five-point, Likert-style questionnaire was administered to PLWH to assess views and intentions towards accepting LTBI screening and treatment. Subsequent Immune Gamma Release Assay (IGRA) testing was offered, and chemoprophylaxis if required. Influencing demographic and psychological associations with planned, and actual, testing and treatment uptake, were assessed using multivariable logistic regression.

Results: 444/716 (62%) patients responded. 417/437 (95.4%) expressed intention to accept LTBI testing. The only significant association was the perceived importance of testing to the individual (aOR 8.98, 95% CI 2.55 – 31.67). 390/393 (99·2%) accepted appropriate IGRA screening; 41/390 (10·5%) were positive. 397/431 (92.1%) expressed intention to accept chemoprophylaxis, associated with perceived importance of treatment (aOR 3.52, 95% CI 1.46 – 8.51), a desire to have treatment for LTBI (aOR 1.77, 95% CI 0.99 – 3.15), and confidence in taking treatment (aOR 3.77, 95% CI 1.84 – 7.72). Of those offered chemoprophylaxis, 36/37 (97·3%) accepted and 34/36 (94·4%) completed treatment. There were no correlates with actual screening acceptance.

Conclusions: LTBI is common amongst PLWH, highlighting the importance of robust screening and treatment programmes. This study shows that screening and treatment for LTBI is highly acceptable to PLWH and provides strong, objective, evidence for policy-makers developing guidelines in this cohort.

Introduction

Despite advances in, and the widespread use of, highly active antiretroviral therapy (HAART), people living with HIV infection (PLWH) continue to be at an increased risk of developing active tuberculosis (TB) as a result of reactivation of latent tuberculosis infection (LTBI). [1,2] Globally the risk of developing TB is up to 30 times higher for PLWH than for those who are HIV negative [3] and increased mortality is noted even in low TB incidence countries. [4] In order to reduce the risk of active TB in this population, LTBI screening and treatment with chemoprophylaxis [3,5] is prioritised for PLWH in national and international guidelines. [6-9] However, our previous work has shown that in the UK there remains significant heterogeneity in LTBI screening of PLWH. [10]

Despite the consensus on LTBI diagnosis and prevention in this population, there is little data on the factors determining planned and actual behaviour with respect to LTBI testing and treatment uptake in PLWH. Information such as this is highly critical and of direct relevance to policy-makers and clinicians if LTBI screening is to be scaled up and implemented into routine clinical, programmatic, practice.

Therefore, we aimed to address this gap in the evidence-base by prospectively evaluating the planned, and actual, behaviours of PLWH, with regards to LTBI testing and treatment.

Methods

We undertook a prospective study at two HIV clinics in the UK (University Hospitals Leicester NHS Trust, Leicester, and Coventry and Warwickshire Partnership NHS Trust, Coventry). Potential participants were given a personalised invitation letter, a study information leaflet, and a booklet that explained TB and LTBI, Interferon Gamma Release Assay (IGRA) testing, chemoprophylaxis and potential side effects. Patients were asked to read these documents and then complete the questionnaire if they wished to participate. All patients were subsequently offered IGRA testing, and LTBI chemoprophylaxis, where clinically appropriate.

Study population, participants and methods of screening

Between April 2014 and September 2017 (inclusive), PLWH who were attending HIV services at one of the two participating centres were eligible to take part. Inclusion criteria were; male and female adult

patients (≥16 years); currently receiving care for HIV from one of the two centres; from all ethnic backgrounds; irrespective of antiretroviral treatment or other medical comorbidities. In Leicester, patients with any CD4 count were included. In Coventry, only patients with CD4 counts below 500 were included, as funding for IGRA testing in that centre was dependent upon individuals meeting the NICE guidance in force at the time, which recommended screening only at CD4 counts below 500. [11] We excluded; known previous diagnosis of active or latent TB; residence in prison; a lack of capacity to consent to participate; non-English speakers and/or those unable to read English where no translator was available in clinic; or where the treating clinician felt that participation would be detrimental to the wellbeing of the patient (such as acute distress associated with HIV diagnosis).

All sequential, eligible patients were approached as they attended for clinic follow-up, with no randomisation. The participant information leaflet made it apparent that individuals would be offered screening irrespective of whether they wished to participate in the questionnaire study.

Questionnaire design

An elicitation study to determine possible beliefs around LTBI testing and treatment was not performed. However, other studies on LTBI chemoprophylaxis were examined and common themes extracted, forming the basis of our questionnaire (available in the Supplementary Material), which was designed around the psychological model of behaviour change, the Theory of Planned Behaviour. This model proposes that the intention of an individual to carry out certain behaviours is dependent upon three variables; the individual's overall attitude towards the behaviour; the actual or perceived influence of others (subjective norms); and the perceived control that the individual feels that they have over the behaviour. The theory has been widely utilised to investigate the acceptability of other health-related interventions. [12-15]

The questionnaire asked a series of questions pertaining to the planned intentions of accepting screening/treatment, and potential influencing factors which had been identified from the literature. A five-point Likert-scale ranging from 1 (Strongly agree) through 2 (Agree), 3 (Uncertain), 4 (Disagree) and 5 (Strongly disagree) was used. Additional demographic questions and whether individuals had previously been diagnosed with, or treated for, active or latent TB were included. There was a free text box to enable simple thematic analysis of general comments related to LTBI testing and treatment. Readability indices were obtained for written patient materials and all scored between 7.3-8.6 on the Flesch-Kincaid Grade.

Data collection

Demographic data were collected from the questionnaire and hospital records. We used a slightly modified version of the World Bank analytical grouping [16] to cohort countries together into specific regions of birth (all patients in the Europe/Central Asia group were actually from Europe). Ethnicity was coded according to the national NHS data dictionary. [17]

Interferon gamma release assay testing and clinical management of positive results

IGRA testing varied slightly between the two sites according to which tests were available locally. Coventry used T-SPOT®.*TB* tests for all patients, whereas Leicester used QuantiFERON-TB® Gold In-Tube Test (QFN-GIT) (and more latterly QuantiFERON-TB® Gold Plus (QFT-Plus)) for those with CD4 counts ≥200, and T-SPOT®.*TB* tests in conjunction with QuantiFERON-TB® tests for those with CD4 counts <200. All positive or borderline positive tests were classified as being positive, and clinical review took place before LTBI treatment was offered. The choice of treatment regime was determined by the treating clinician and was either six months of isoniazid monotherapy (32/36 patients) or three months of rifampicin/isoniazid (4/36 patients). Clinicians were blinded to the questionnaire responses.

Statistical analysis

Assuming an estimated total population size of 1,000 subjects meeting the inclusion criteria, of whom a hypothesised proportion of 50% indicate that they would accept screening for LTBI (with a margin of error of 5% around this proportion) and a design effect (deff) of 1, a total of 278 subjects would be required to be recruited. Assuming a response rate of 50% we would inflate the sample size to 556.

Demographic characteristics were summarised using median for age and proportions/percentages for categorical variables; comparisons were made using the non-parametric Mann-Whitney U-test and Pearson's chi-square test (or Fishers exact test if appropriate) respectively.

Responses to individual Likert-scale questions were excluded if none, or more than one, of the response options was ticked. We described the distribution of responses as proportions to gain an overall understanding of the views and beliefs of patients with respect to LTBI screening and treatment. Factors including age, gender, region of birth, known TB contact and responses to the relevant Likert-style questions were tested for their association with the planned intention and actual behaviour to take up LTBI testing and treatment, using separate logistic regression models after amalgamating "strongly agree" and "agree" into one group, and the remainder into a separate group. Univariable and multivariable associations of demographic and influencing factors from the theory of planned behaviour domains associated with testing or treatment for LTBI were reported as crude, and adjusted, odds ratios (OR) and 95% confidence intervals (CI). Multivariable models were adjusted for factors associated with the relevant outcome in univariable logistic regression models ($p \leq 0.05$). Statistical analyses were performed using Stata v14.0 (Statacorp. 2015).

Consent and Ethics approval

Ethics approval was granted by the NRES Committee North West – Greater Manchester South (reference number 13/NW/0895). As per our ethics approval, consent was presumed if the patient completed at least one question on the questionnaire [18] and returned it.

Results

Response rate

716 individuals were offered the questionnaire. 272/716 (38%) declined immediately or failed to return the questionnaire and were presumed to have declined to participate (Figure 1). Overall 444/716 (62%) participated. Responses to the Likert-scale questions are available in the Supplementary Material.

Language translator

Only four respondents indicated that they had needed the assistance of a translator. An English speaker was required by a further three respondents to help them understand and complete the questionnaire.

Demographics

Table 1 details the demographic data of the questionnaire respondents and non-respondents. 52.5% were black African and the cohort was relatively young, with median age 42 years. There was no significant difference between the cohorts in terms of age, sex or ethnicity.

Previous TB/LTBI

29/444 (6·5%) reported that they had been previously treated for active TB, although this information had not been recorded in their medical notes. These individuals were excluded from IGRA testing. No respondents indicated that they had had prior LTBI diagnosis or treatment.

Views about, and intention to accept, IGRA testing

Intention to accept LTBI screening was tested by the response to the first questionnaire statement, "I plan to accept a blood test for latent TB". 417/437 (95.4%) strongly agreed or agreed with this, and the result was similar (390/408, 95.6%) after excluding those with previous active TB.

There was agreement that it was important to test, and important to know whether one had LTBI by 393/435 (90·3%) and 412/433 (95·2%) respectively, and a desire to know whether they had LTBI was expressed by 402/429 (93·7%). However, only 107/422 (25·4%) agreed with the statement that they were at risk of having been exposed to TB previously.

There was a hierarchy in the proportions of respondents who felt that other individuals would wish them to undergo testing, ranging from 307/430 (71·4%) for their clinic doctor, to 232/427 (54·3%) for other significant individuals in their life, down to 165/428 (38·6%) for others attending the same clinic. High proportions of individuals expressed uncertainty as to whether these individuals would wish them to test. 99/424 (23·3%) felt that they would experience prejudice if they underwent testing.

There was high agreement with the concept of having control over the testing process and being able to decline the test (392/435, 90·1% and 395/434, 91% respectively).

Views about, and intention to accept, LTBI chemoprophylaxis

Intention to accept chemoprophylaxis (if advised) was tested by the response to the twelfth questionnaire statement, "I plan to take treatment for latent TB…." and agreed to by 397/431 (92·1%). Similar to the intention to undergo testing, there was high agreement that treatment was important (415/432, 96·1%), but low agreement with the statement that they were at risk of developing active TB (101/407, 24·8%). The behavioural norms trends were also similar to the intention to undergo testing, with the respondents agreeing that their clinic doctor, other significant individuals, and other clinic patients would wish them to receive treatment in 388/431 (90%), 318/425 (74·8%) and 233/429 (54·3%) cases respectively. Concern about prejudice was low at 90/419 (21·5%) and perceived control over treatment declination was high at 401/429 (93·5%).

Factors associated with intention to accept LTBI testing and treatment

Factors significant on univariable analysis were taken forward into multivariable analysis. The only significant association with the intention to accept LTBI testing (Table 2) was the importance of testing to the individual (aOR 8.98, 95% CI 2.55 – 31.67).

Intention to accept chemoprophylaxis (Table 3) was determined by the belief that treatment was important (aOR 3.52, 95% CI 1.46 – 8.51), a desire to have treatment for LTBI (aOR 1.77, 95% CI 0.99 – 3.15), and being confident in the ability to take treatment (aOR 3.77, 95% CI 1.84 – 7.72).

Actual LTBI testing, cascade of care and treatment uptake

IGRA testing uptake amongst questionnaire respondents was 390/393 (99·2%) for whom testing was appropriate. Questionnaire respondents and non-respondents did not differ in acceptance of IGRA testing (p=0·95) (Table 1).

41/390 (10·5%) IGRA screened respondents had a positive IGRA and 40/41 (97·5%) were diagnosed with LTBI after clinical and radiological assessment. 34/36 (94.4%) of those offered treatment completed chemoprophylaxis as determined by the treating clinician.

Questionnaire respondents and non-respondents did not differ in their acceptance of LTBI treatment (if offered), or completion of treatment (p=0·15 and p=0·5 respectively) (Table 1).

Factors associated with actual LTBI testing and treatment uptake

Acceptance of LTBI testing was not associated with any demographic factor or questionnaire response on multivariable regression analysis (Table 4). The numbers accepting and completing chemoprophylaxis were too small to enable any meaningful regression analysis to be conducted.

Comments from respondents

69 individuals wrote comments in the free text box, which were grouped into themes (data not shown). 33 comments were supportive of testing and treatment; 12 indicated a desire for more information on some aspect of LTBI diagnosis/management; and 20 were comments of a general nature, mostly describing personal health experiences. Only four comments were not supportive of testing or treatment

Discussion

We explored, through the first study in this field, the intentions of PLWH towards accepting testing and treatment for LTBI through the provision of patient information, implementing a questionnaire study, and offering IGRA testing. We demonstrated that LTBI screening and treatment is highly acceptable to PLWH in the UK, thereby underpinning the expansion of LTBI screening and treatment as an important public health intervention to reduce TB-associated morbidity and mortality in this high-risk population across many different settings. LTBI prevalence in this study was high, at over 10%, highlighting a real need to ensure robust screening pathways are introduced as part of clinical care. We have previously demonstrated that there is currently limited LTBI screening occurring amongst PLWH in the UK. [10] This is the first study to examine these issues in any real detail, although a range of LTBI chemoprophylaxis acceptance rates of between 17-85% in PLWH have been reported from elsewhere in the UK and other low TB incidence countries. [19-21]

In our cohort, LTBI testing and chemoprophylaxis uptake was very high. Over 99% of questionnaire respondents accepted IGRA testing, and over 94% of those who were consequently diagnosed with LTBI and for whom chemoprophylaxis was recommended, successfully completed treatment. There was

reassuringly no statistical difference between patients who participated in the study, and those who declined to participate, in terms of acceptance of LTBI testing and chemoprophylaxis uptake. This indicates that our study cohort is representative of our wider HIV cohort. We have demonstrated that operationalising this screening is feasible as part of routine care in the UK, and that it is possible to do this without sustaining the losses noted by others during the cascade of care for LTBI screening and treatment. [22]

It is likely that there were multifactorial reasons behind these results, including the fact that all patients were attending regular follow-up in our clinics, screening had been integrated into clinical pathways, and many of our HIV clinicians are infectious diseases clinicians experienced in TB and LTBI management. It is important that all HIV clinicians receive training in the diagnosis and treatment of LTBI as part of the expansion of screening.

Interestingly, 6% of individuals reported having had active TB previously, although this information was not documented in their medical notes. Almost all had had treatment for TB overseas, prior to their arrival in the UK. This serves to highlight the importance of ensuring that a complete medical history is taken by clinics at the point of initiating care of PLWH, in order to avoid unnecessary IGRA testing or inappropriate treatment.

We did not find that the intention to accept screening was influenced by subjective norms, including fear of prejudice, although this has been reported previously [23] or by perceived control over the testing process. Modern approaches to care in terms of shared clinician-patient clinical decision-making may influence the latter. A perception that the testing process was inherently important influenced both the intent to test and to accept chemoprophylaxis. Whether this stems from a true belief that TB is an important disease, or simply because study information had been provided, is unknown.

Notably, low numbers of respondents felt that they were at risk of TB exposure, or of developing active TB, despite the well-known risks in HIV infection. [1,2,4] Interestingly, despite this view, high numbers did ultimately accept screening. No specific factors influenced IGRA testing acceptance. There may be some other, unexplored influence, such as the personal interaction with a clinician and a further qualitative study to examine whether, and why, attitudes alter after the clinical encounter, would be interesting. Provision of specific educational materials to enhance understanding of TB epidemiology might also be useful adjuncts for screening programmes endeavouring to achieve high LTBI screening/treatment outcomes amongst PLWH.

Self-belief in the ability to take LTBI treatment was one of the factors significantly correlated with the intention to accept chemoprophylaxis. Over 95% of our HIV cohort is virologically suppressed on HAART and therefore the ability to adhere faithfully to daily tablet treatment is already tried and tested. Although increasing number of daily medication doses has negatively influenced adherence in other studies [24], we demonstrated that over 94% of those given LTBI chemoprophylaxis did complete treatment. The only two individuals who did not, developed adverse effects from treatment which necessitated cessation. This suggests that PLWH who are offered LTBI treatment are confident and motivated in their adherence to medication, and is an important point to consider when contemplating systematic screening.

One of the limitations of our study was that it only included individuals from two centres in the UK. Over half were from sub-Saharan Africa, although other respondents were from a diverse range of cultural backgrounds. It is possible that slightly different results may have been obtained if we had extended the questionnaire to other HIV centres, either nationally or internationally. The patient literature and questionnaire was written as simply as possible in English, in keeping with guidance from the NHS [25] and the NIH [26] but we could potentially have had the documents translated into different languages, given our diverse ethnic cohort. We had four patients who required the assistance of language translators. Additionally, three patients required the assistance of an English speaker in order to help them understand and complete the questionnaire. This highlights the importance of verbal counselling, alongside written information, in order to ensure that patients from a wide variety of socio-economic and educational backgrounds all have the opportunity to provide informed consent for screening.

A further limitation of this study was that we had only an overall response rate of 62%, from patients approached to participate. Previous work indicates that response rates may be increased through the use of digital questionnaires, small monetary incentives, provision of a pre-notification letter about the forthcoming questionnaire, and a reminder. [27-29] Nevertheless, there were no significant differences in terms of acceptance of screening and treatment between the cohorts of questionnaire respondents and non-respondents, thus suggesting that our study cohort is representative of PLWH who attend for care at our centres.

In our study, meticulous planning and constant oversight of the IGRA testing process ensured that as many individuals as possible were given the opportunity to undergo LTBI screening as part of clinical care. Without this logistical oversight, we feel that far fewer patients would have undergone LTBI screening, and it is a potential barrier to the same level of screening being replicated elsewhere.

In summary, we have demonstrated that LTBI screening and treatment is viewed positively by PLWH in the UK and that this positive intention translates to high levels of screening and chemoprophylaxis completion rates. This has important consequences for public health, and clinical teams implementing more widespread LTBI screening programmes in low TB burden countries. The results of this study provide strong, objective, evidence for policy-makers developing guidelines on latent TB prevention in this high-risk cohort.

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Table 1. Demographics for questionnaire respondents and non-respondents

Variable	Questionnaire accepted n (%) n = 444	Questionnaire declined n (%) n = 272	p
Male sex	239 (53.8)	140 (51.5)	0.539
Median age	42	43	0.229
Ethnicity			
White	150 (33.8)	77 (28.3)	0.125
Black	234 (52.7)	163 (60)	0.056
Asian	39 (8.8)	28 (10.3)	0.504
Mixed/Other	21 (4.7)	4 (1.5)	0.023
Country of birth[1]			
Sub-Saharan Africa	249 (57.11)	-	
Europe	159 (36.47)	-	
South Asia	17 (3.9)	-	
Other	11 (2.52)	-	
Reported previous TB[2]	29 (6.5)	-	
Reported previous LTBI	0 (0)	-	
Acceptance of appropriate IGRA testing	390/393 (99.2)	255/257 (99.2)	0.9483
Acceptance of LTBI treatment if LTBI diagnosed and treatment advised	36/37 (97.3)	31/35 (88.6)	0.15
Completion of treatment if LTBI treatment started	34/36 (94.4)	28/31 (90.3)	0.5

Footnotes

[1] 436 respondents stated their country of birth. "Other" includes East Asia and Pacific, Latin America and Caribbean, Middle East and North Africa, and North America

[2] Excluded from IGRA testing

Table 2. Univariate and multivariable regression analysis for factors associated with intention to accept latent TB infection screening

Variable		Intent to accept testing	Unadjusted OR (95% CI) (Univariate analysis)	P value	Adjusted OR (95% CI) (Multivariable analysis)	P value
Age			1.03 (0.98 - 1.08)	0.21		
Gender	Male	225/235 (95.74)	1			
	Female	192/202 (95.05)	0.85 (0.35 - 2.09)	0.73		
World Bank region of birth	Europe	154/158 (97.47)	1			
	Sub-Saharan Africa	230/243 (94.65)	0.46 (0.15 - 1.44)	0.18		
	South Asia and Other	27/28 (96.43)	0.70 (0.08 - 6.52)	0.76		
Known TB contact	No	317/332 (95.48)	1 (1 - 1)			
	Yes	89/92 (96.74)	1.40 (0.40 - 4.96)	0.60		
It is important that I have a blood test for latent TB			21.22 (7.66 - 58.79)	<0.001	8.98 (2.55- 31.67)	0.001
It is important that I know whether I have latent TB or not			9.16 (4.30 - 19.53)	<0.001	1.76 (0.53 -5.81)	0.36
I am at risk of having caught TB in the past			1.77 (1.12 - 2.79)	0.01	0.90 (0.43 - 1.89)	0.78
I want to know whether I have latent TB			7.63 (3.77 - 15.44)	<0.001	2.27 (0.66 – 7.76)	0.19
My clinic doctor would expect me to be tested for latent TB			3.96 (2.37 - 6.60)	<0.001	1.69 (0.57 -5.01)	0.35
Other people attending the clinic would expect me to be tested for latent TB			2.10 (1.35 - 3.27)	0.001	0.70 (0.24 - 2.02)	0.51
I know people who would be prejudiced against me if I had a test for latent TB			1.33 (0.87 - 2.02	0.19		
Other significant people in my life would expect me to be tested for latent TB			1.99 (1.34 - 2.95)	0.001	1.40 (0.67 -2.94)	0.37
I would feel able to tell my doctor if I did not want to have a test for latent TB			1.63 (1.06 - 2.50)	0.027	1.00 (0.26 - 3.88)	0.10
It is up to me whether or not to have a test for latent TB			1.65 (1.14 - 2.39)	0.007	1.25 (0.41 -3.81)	0.70

Table 3. Univariate and multivariable regression analysis for intention to accept latent TB infection treatment

Variable		Intent to accept treatment	Unadjusted OR (95% CI) (Univariate analysis)	P value	Adjusted OR2 (95% CI) (Multivariable analysis)	P value
Age			1.01 (0.97 - 1.05)	0.51		
Gender	Male	221/234 (94.44)	1			
	Female	176/197 (89.94)	0.49 (0.24 - 1.01)	0.05	0.70 (0.29 – 1.72)	0.44
World Bank region of birth	Europe	148/157 (94.27)	1			
	Sub-Saharan Africa	220/241 (91.29)	0.64 (0.28 - 1.43)	0.27		
	South Asia and Other	26/27 (96.30)	1.58 (0.19 - 13.00)	0.67		
Known TB contact	No	304/331 (91.84)	1			
	Yes	82/89 (92.13)	1.04 (0.44 - 2.47)	0.93		
I am at risk of developing active TB			2.08 (1.40 - 3.10)	<0.001	1.46 (0.86 - 2.50)	0.17
It is important for me to have treatment if I have latent TB			5.82 (3.23 - 10.51)	<0.001	3.52 (1.46 -8.51)	0.005
I want to have treatment for latent TB			3.31 (2.22 - 4.95)	<0.001	1.77 (0.99 - 3.15	0.05
My clinic doctor would expect me to take treatment for latent TB if she/he recommended it			4.09 (2.49 - 6.71)	<0.001	1.66 (0.65 – 4.28)	0.29
Other people attending the clinic would expect me to take treatment for latent TB			1.75 (1.26 - 2.43)	0.001	0.60 (0.208- 1.31)	0.20
Other significant people in my life would expect me to take treatment for latent TB			2.05 (1.51 - 2.79)	<0.001	0.97 (0.47 - 1.99)	0.93
I know people who would be prejudiced against me if I took treatment for latent TB			1.14 (0.83 - 1.57)	0.41		
I am confident that I could take the tablets every day for 6 months			5.54 (3.27 - 9.39)	<0.001	3.77 (1.84 – 7.72)	<0.001
Knowing the possible side effects of the tablets makes it more difficult for me to decide about taking the treatment			0.82 (0.60 - 1.13)	0.23		
It is up to me to decide whether or not to have this treatment			0.92 (0.60 - 1.41)	0.71		
I would feel able to tell my doctor if I did not want to have this treatment			0.92 (0.54 - 1.545	0.75		
Being pregnant or trying to get pregnant makes it more difficult for me to decide about taking the treatment (leave this			0.85 (0.47 - 1.53)	0.58		

question blank if not appropriate)
Females only analysed (n=75)

Table 4. Univariate and multivariable regression analysis for factors associated with actual acceptance of latent TB infection screening

Variable		Tested	Unadjusted OR (95% CI) (95% CI)	p value	Adjusted OR (95% CI) (95% CI)	p value
Age			1.03 (0.98 - 1.07)	0.26		
Gender	Male	215/227 (94.71)	1			
	Female	175/188 (93.09)	0.75 (0.33 - 1.69)	0.49		
World Bank region of birth	Europe	146/156 (93.59)	1			
	Sub-Saharan Africa	215/225 (95.56)	1.47 (0.60 - 3.63)	0.40		
	South Asia and Other	22/26 (84.62)	0.38 (0.11 - 1.31)	0.12		
Known TB contact	No	299/319 (93.73)	1			
	Yes	79/84 (94.05)	1.06 (0.38 - 2.90)	0.92		
I plan to accept a blood test for latent TB			1.73 (1.05 - 2.83)	0.03	0.82 (0.34 - 2.00)	0.66
It is important that I have a blood test for latent TB			1.72 (1.08 - 2.75)	0.02	0.80 (0.31 - 2.12)	0.66
It is important that I know whether I have latent TB or not			2.04 (1.22 - 3.41)	0.006	1.26 (0.49 - 3.24)	0.63
I am at risk of having caught TB in the past			1.26 (0.83 - 1.89)	0.28		
I want to know whether I have latent TB			2.41 (1.51 - 3.85)	<0.001	1.93 (0.92-4.05)	0.08
My clinic doctor would expect me to be tested for latent TB			1.77 (1.18 - 2.67)	0.006	1.44 (0.85 -2.43)	0.18
Other people attending the clinic would expect me to be tested for latent TB			1.31 (0.90- 1.93)	0.16		
I know people who would be prejudiced against me if I had a test for latent TB			1.21 (0.83 - 1.75)	0.32		
Other significant people in my life would expect me to be tested for latent TB			1.36 (0.96 - 1.92)	0.08		
I would feel able to tell my doctor if I did not want to have a test for latent TB			1.33 (0.87 - 2.04)	0.19		
It is up to me whether or not to have a test for latent TB			1.55 (1.09 - 2.21)	0.02	1.36(0.88 - 2.11)	0.17

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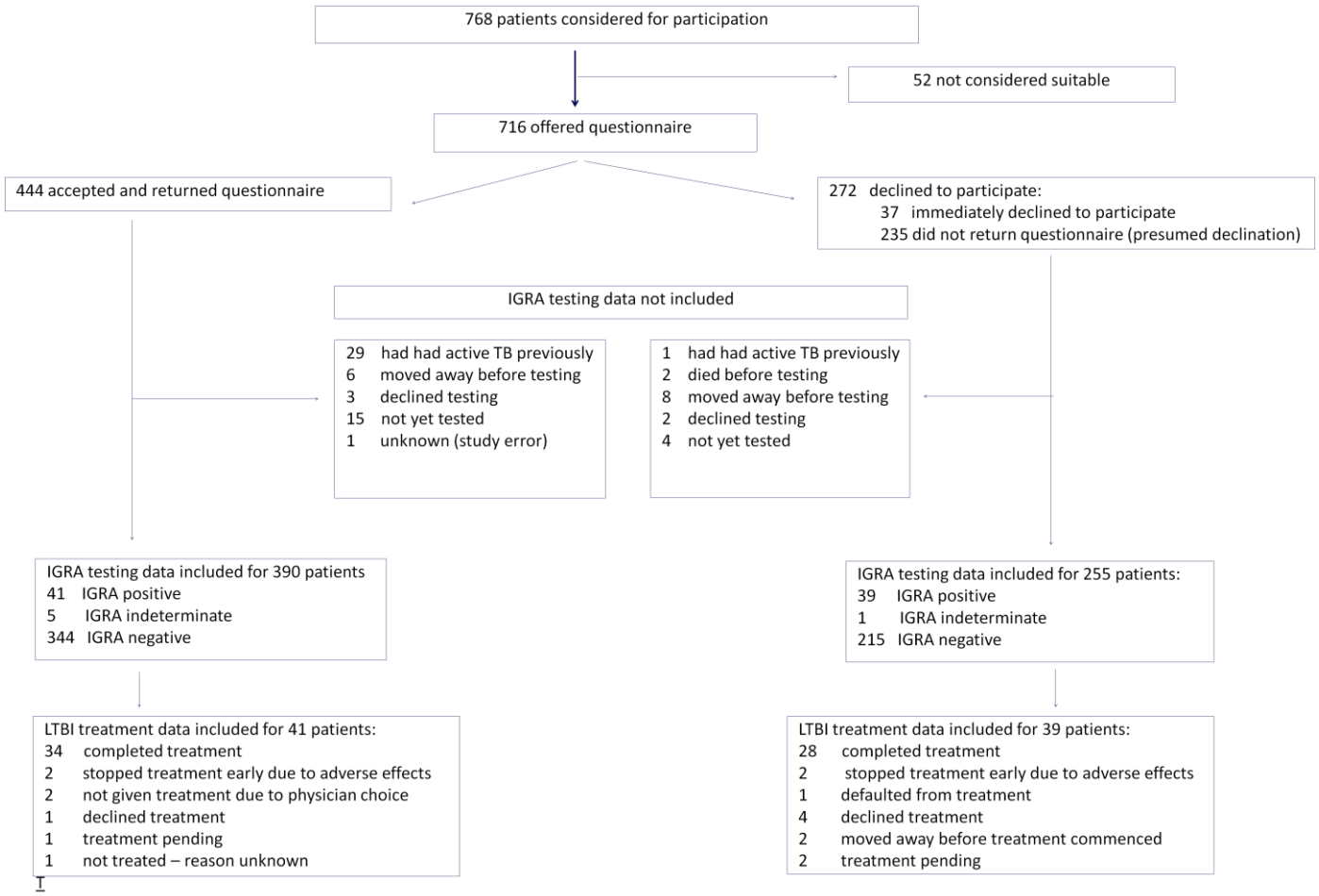
Figure 1. Flowchart of questionnaire participation and outcomes of LTBI screening and treatment



Supplementary information

Latent tuberculosis screening and treatment in HIV: highly acceptable in a prospective cohort study

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Study number

Questionnaire on latent TB testing and treatment

Please read the leaflet entitled "Latent tuberculosis (TB) testing" first.

We are doing a study to find out what people think about being tested for latent (dormant, sleeping) TB, and whether they would take treatment if it was recommended to them. We are asking all the patients attending our clinics what they think about this. We will use the information that people give us to try and work out what kind of tests and treatment should be offered to other people in the UK.

We are interested in your opinions and invite you to complete this questionnaire.

Completing the questionnaire is entirely voluntary and you do not have to put your name on the questionnaire. If the results are published then it will not be possible to identify anybody who has completed the questionnaire.

Your completed questionnaire will be held securely at the Leicester Royal Infirmary, and only the doctors and nurse involved in the study will have access to it.

None of your answers affects any care that you currently receive from the clinic.

Please ask if you would like more information about this questionnaire.

If you are happy to take part in this study then please complete the questions below. Your opinions are important to us and we aim to improve our service to you and others.

If a translator was used to assist in completing this questionnaire, please write which language was used for translation

_____

The next questions are about the blood test to see whether you have latent TB
Please tick <u>one</u> answer to indicate how strongly you agree or disagree with the statement

		Strongly agree	**Agree**	**Uncertain**	**Disagree**	**Strongly disagree**
1	I plan to accept a blood test for latent TB (Taken at the same time as other blood tests in clinic)					
2	It is important that I have a blood test for latent TB					
3	It is important that I know whether I have latent TB or not					
4	I am at risk of having caught TB in the past					
5	I want to know whether I have latent TB					
6	My clinic doctor would expect me to be tested for latent TB					
7	Other people attending the clinic would expect me to be tested for latent TB					
8	I know people who would be prejudiced against me if I had a test for latent TB					
9	Other significant people in my life would expect me to be tested for latent TB					
10	I would feel able to tell my doctor if I did not want to have a test for latent TB					
11	It is up to me whether or not to have a test for latent TB					

The next questions are about the treatment you may be offered if you are diagnosed with latent TB
Please tick <u>one</u> answer to indicate how strongly you agree or disagree with each statement

		Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
12	I plan to take treatment for latent TB if it is recommended to me by my doctor (usually 4 tablets a day for 6 months)					
13	I am at risk of developing active TB					
14	It is important for me to have treatment if I have latent TB					
15	I want to have treatment for latent TB					
16	My clinic doctor would expect me to take treatment for latent TB if she/he recommended it					
17	Other people attending the clinic would expect me to take treatment for latent TB					
18	Other significant people in my life would expect me to take treatment for latent TB					
19	I know people who would be prejudiced against me if I took treatment for latent TB					
20	I am confident that I could take the tablets every day for 6 months					
21	Knowing the possible side effects of the tablets makes it more difficult for me to decide about taking the treatment					
22	It is up to me to decide whether or not to have this treatment					
23	I would feel able to tell my doctor if I did not want to have this treatment					
24	Being pregnant or trying to get pregnant makes it more difficult for me to decide about taking the treatment **(leave this question blank if not applicable)**					

25. Age _____ 26. **Male** ☐ **Female** ☐

27. Ethnicity (please tick one box)

White		**Black or Black British**	
British	☐	Caribbean	☐
Irish	☐	African	☐
Any other White background	☐	Any other Black background	☐
Mixed		**Asian or British Asian**	
White and Black Caribbean	☐	Indian	☐
White and Black African	☐	Pakistani	☐
White and Asian	☐	Bangladeshi	☐
Any other mixed background	☐	Any other Asian background	☐
Other Ethnic groups			
Chinese	☐	**Prefer not to say**	☐
Any other ethnic group	☐		

28. Which is your first language (mother tongue)? _____

29. Country of birth _____

30. If you were born outside of the UK, when did you move to the UK? _____

31. Have you ever been diagnosed with TB before? **Yes** ☐ **No** ☐

32. If you have been diagnosed with TB before, were you given treatment for TB?
Yes ☐ **No** ☐

33. Have you had treatment for latent (sleeping, dormant) TB before?
Yes ☐ **No** ☐

34. Do you know anyone who has had TB? **Yes** ☐ **No** ☐

35. If you know someone who has had TB, who was it? (You don't need to write their name – just state whether it was someone in your family e.g. mother, husband, or a work colleague, or close friend)_____

Please make any other comments you may have about latent TB testing or treatment

Thank you very much for completing this questionnaire
Please discuss any concerns you have about latent TB with your doctor

Supplementary Table 1: Full questionnaire responses

	Strongly Agree n (%)	Agree n (%)	Uncertain n (%)	Disagree n (%)	Strongly Disagree n (%)
1. I plan to accept a blood test for latent TB (Taken at the same time as other blood tests in clinic)	266/437 (60.9)	151/437 (34.6)	13/437 (3.0)	3/437 (0.7)	4/437 (0.9)
2. It is important that I have a blood test for latent TB	239/435 (54.9)	154/435 (35.4)	34/435 (7.8)	7/435 (1.6)	1/435 (0.2)
3. It is important that I know whether I have latent TB or not	279/433 (64.4)	133/433 (30.7)	18/433 (4.2)	2/433 (0.5)	1/433 (0.2)
4. I am at risk of having caught TB in the past	51/422 (12.1)	56/422 (13.3)	204/422 (48.3)	72/422 (17.1)	39/422 (9.2)
5. I want to know whether I have latent TB	244/429 (56.9)	158/429 (36.8)	21/429 (4.9)	3/429 (0.7)	3/429 (0.7)
6. My clinic doctor would expect me to be tested for latent TB	150/430 (34.9)	157/430 (36.5)	105/430 (24.4)	12/430 (2.8)	6/430 (1.4)
7. Other people attending the clinic would expect me to be tested for latent TB	81/428 (18.9)	84/428 (19.6)	186/428 (43.5)	55/428 (12.9)	22/428 (5.1)
8. I know people who would be prejudiced against me if I had a test for latent TB	38/424 (9.0)	61/424 (14.4)	139/424 (32.8)	116/424 (27.4)	70/424 (16.5)
9. Other significant people in my life would expect me to be tested for latent TB	102/427 (23.9)	130/427 (30.4)	114/427 (26.7)	60/427 (14.1)	21/427 (4.9)
10. I would feel able to tell my doctor if I did not want to have a test for latent TB	191/434 (44)	204/434 (47)	22/434 (5.1)	10/434 (2.3)	7/434 (1.6)
11. It is up to me whether or not to have a test for latent TB	229/435 (52.6)	163/435 (37.5)	16/435 (3.7)	17/435 (3.9)	10/435 (2.3)
12. I plan to take treatment for latent TB if it is recommended to me by my doctor (usually 4 tablets a day for 6 months)	241/431 (55.9)	156/431 (36.2)	25/431 (5.8)	6/431 (1.4)	3/431 (0.7)
13. I am at risk of developing active TB	44/407 (10.8)	57/407 (14)	225/407 (55.3)	57/407 (14)	24/407 (5.9)
14. It is important for me to have treatment if I have latent TB	258/432 (59.7)	157/432 (36.3)	12/432 (2.8)	5/432 (11.6)	0/432 (0)
15. I want to have treatment for latent TB	160/417 (38.4)	145/417 (34.8)	96 /417 (23.0)	9/417 (2.2)	7/417 (1.7)

16. My clinic doctor would expect me to take treatment for latent TB if she/he recommended it	187/431 (43.4)	201/431 (46.7)	35/431 (8.1)	6/431 (1.4)	2/431 (0.5)
17. Other people attending the clinic would expect me to take treatment for latent TB	103/429 (24)	130/429 (30.3)	139/429 (32.4)	42/429 (9.8)	15/429 (3.5)
18. Other significant people in my life would expect me to take treatment for latent TB	156/425 (36.7)	162/425 (38.1)	70/425 (16.5)	25/425 (5.9)	12/425 (2.8)
19. I know people who would be prejudiced against me if I took treatment for latent TB	42/419 (10)	48/419 (11.5)	164/419 (39.1)	101/419 (24.1)	64/419 (15.3)
20. I am confident that I could take the tablets every day for 6 months	213/427 (49.9)	159/427 (37.2)	49/427 (11.5)	4/427 (0.9)	2/427 (0.5)
21. Knowing the possible side effects of the tablets makes it more difficult for me to decide about taking the treatment	49/425 (11.5)	108/425 (25.4)	138/425 (32.5)	99/425 (23.3)	31/425 (7.3)
22. It is up to me to decide whether or not to have this treatment	191/430 (44.4)	199/430 (46.8)	15/430 (3.5)	16/430 (3.7)	9/430 (2.1)
23. I would feel able to tell my doctor if I did not want to have this treatment	195/429 (45.5)	206/429 (48)	17/429 (4.0)	9/429 (2.1)	2/429 (0.5)
24. Being pregnant or trying to get pregnant makes it more difficult for me to decide about taking the treatment (please leave blank if not applicable)	21/111 (18.9)	21/111 (18.9)	44/111 39.6)	14/111 (12.6)	11/111 (9.9)