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Prevalence of latent tuberculosis infection among gold miners in South Africa

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SUMMARY

SETTING: South African gold mines.

OBJECTIVE: To determine the prevalence of latent tuberculosis infection (LTBI) and risk factors for a positive tuberculin skin test (TST) among gold miners.

DESIGN: Cross-sectional survey. Human immunodeficiency virus (HIV) status was determined by self-report and medical records. TST positivity was defined by the mirror method to estimate the prevalence of LTBI, and by the US Centers for Disease Control and Prevention definitions to explore risk factors at the individual level.

RESULTS: Among 429 participants (105/130 subjects aged <30 years, 324/390 ⩾30 years), the estimated prevalence of LTBI was 89%; 45.5% of HIV-positive participants had a zero TST response compared to respectively 13% and 13.5% in the HIV-negative and status unknown participants. In participants with TST > 0, there was no significant difference between size of response by HIV status: the mean (standard deviation) widths for HIV-positive, HIV-negative and HIV status unknown were respectively 11.84 (2.75), 12.03 (2.75) and 12.52 mm (3.04) (analysis of variance $P = 0.28$). Factors independently associated with a TST < 10 mm were positive HIV status (aOR 0.41, 95%CI 0.17–0.96) and not working underground (aOR 0.25, 95%CI 0.09–0.71).

CONCLUSIONS: The prevalence of LTBI is very high in gold miners in South Africa. HIV-infected individuals are more likely to have a negative TST, but HIV infection does not affect the size of TST response.

KEY WORDS: tuberculin test; tuberculosis; silicosis; gold mining; South Africa

DURING the 1990s, annual tuberculosis (TB) case notification rates among employees in South African gold mines increased four-fold to exceed 4000 cases per 100 000 person-years in 1999[1] despite a well-implemented TB control programme. The failure of TB control is largely attributable to the escalating human immunodeficiency virus (HIV) epidemic in sub-Saharan Africa.[2–4] South African gold miners, 30% of whom are estimated to be HIV-infected,[5] also have a high prevalence of silicosis, another strong risk factor for TB.[6,7] In the pre-HIV era, the prevalence of latent TB infection (LTBI), as measured by tuberculin skin test (TST), among new recruits[8] and miners with silicosis[9] was very high, but the current prevalence of LTBI is unknown.

The aims of our study were to determine the prevalence of LTBI in a representative sample of gold miners, to investigate the association of LTBI with age as a proxy for duration of exposure to high risk of TB transmission, and to investigate factors associated with a positive TST.

METHODS

Study design and population

In a cross-sectional study between December 2005 and May 2006, employees from four gold mine shafts in South Africa were randomly recruited from two age strata: <30 years and ⩾30 years (assumed high TB exposure).

Study procedures

Participants underwent a questionnaire and medical record review. The most recent occupational health screening chest radiograph (CXR) was read by a single trained reader for evidence of TB and silicosis and graded according to a modified International Labour Organization (ILO) scoring system, whereby for small opacities only frequency was recorded using the ILO 12-point scale. Definite silicosis was defined as a score of ⩾1/1.

TST was administered by trained and quality controlled staff using the Mantoux method with 2 tu-

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berculin units of RT-23 in Tween-80 (Statens Serum Institute, Copenhagen, Denmark) and read 3 days later as the maximum transverse diameter of the induration expressed in millimeters using a digital caliper. The cold chain was maintained, and opened tuberculin vials were used within the recommended period.

Definitions for positive TST and HIV status

In keeping with convention and to maximise comparability with other studies, a positive TST was defined to estimate the prevalence of LTBI using the US Centers for Disease Control and Prevention (CDC) criteria of respectively ⩾10 mm and ⩾5 mm in non-HIV-infected and HIV-infected individuals.[10] For the analysis of individual-level risk factors, the conventionally used[10] ⩾10 mm cut-off was used to define a positive TST.

Stakeholders did not permit HIV testing to be offered for this study. HIV-positive status was therefore defined as participant self-reporting positive status, or a medical record of positive status. HIV-negative status was defined as participant self-reporting negative status, confirmed in the medical records. HIV status unknown was assigned to all others.

Statistical methods

Assuming a 60% prevalence of LTBI, we estimated a sample size of 400 to determine prevalence with a precision of ±4.8%. In 2005, less than 15% of the workforce in the four shafts were aged <30 years (J Lewis, personal communication), and this group was over-sampled so that 30% of study participants were aged <30 years.

The mirror method[11] was also used to estimate the prevalence of LTBI. This assumes that the specificity of TST at the mode is 100%; prevalence is calculated by doubling the number of participants with a reaction size greater than the mode and adding this to the number with a reaction size at the mode, expressing the result as a percentage.[12]

Unadjusted and adjusted odds ratios (aORs) for risk factors for a positive TST were calculated by logistic regression, using the likelihood ratio test to assess significance. A priori, the multivariable model included age (because of the sampling scheme) and previous TB (which should be associated with a positive TST in HIV-negative individuals but negatively confounded by high HIV prevalence in TB patients).

Ethical approval

The study was approved by the Research Ethics Committees of the University of KwaZulu Natal and the London School of Hygiene & Tropical Medicine. Written informed consent, or witnessed verbal consent for participants unable to read or write, was obtained for all participants.

RESULTS

Participation and demographics

Of the 1065 individuals invited, 520 (48.8%) consented to participate, and TST responses were read for 429/520 (82.5%); 105 (24.5%) aged <30 years, and 324 (75.5%) aged ⩾30 years. Table 1 summarises the characteristics of the participants. In the <30-year age group, respectively 26/105 (24.8%), 4/105 (3.8%) and 75/105 (71.4%) participants were HIV-negative, HIV-positive and HIV status unknown. In the ⩾30-year group, respectively 89/324 (27.5%), 29/324 (9%), and 206/324 (63.6%) participants were HIV-negative, HIV-positive, and HIV status unknown.

CXRs were available for 426/429 (99.3%) participants (104 in the <30-year age group and 322 in the

Table 1 Characteristics of participants by age group

Characteristic	Aged <30 years (n = 105) n (%)	Aged ⩾30 years (n = 324) n (%)	P value
Median age, years [IQR]	26 [22–29] (24.5)	43 [30–59] (75.5)	
Sex			0.001*
Male	99 (94.3)	323 (99.7)	
Female	6 (5.7)	1 (0.3)	
Country of origin			<0.001*
South Africa	75 (71.4)	134 (41.4)	
Lesotho	7 (6.7)	75 (23.2)	
Mozambique	21 (20.0)	80 (24.7)	
Other	2 (1.9)	35 (10.8)	
Ethnic group			0.41*
Black	102 (97.1)	319 (98.5)	
White	3 (2.9)	5 (1.5)	
Duration of employment, years			<0.001†
Median	2	19	
Range	<1–13	1–42	
Current frequency of underground work			1.0*
⩾Twice a week	101 (96.2)	310 (95.7)	
Never	4 (3.8)	14 (4.3)	
Employment status			0.007*
Employee	78 (74.3)	279 (86.1)	
Contractor	27 (25.7)	45 (13.9)	
Occupational level‡			0.58*
Unskilled labour	102 (97.1)	305 (94.1)	
Skilled labour	1 (1.0)	9 (2.8)	
Professional	2 (1.9)	10 (3.1)	
Residence			<0.001*
Hostel	52 (49.5)	220 (67.9)	
House§	51 (48.6)	80 (24.7)	
Other	2 (1.9)	24 (7.4)	
HIV status			0.16*
HIV-negative	26 (24.8)	89 (27.5)	
HIV-positive	4 (3.8)	29 (9.0)	
HIV-unknown	75 (71.4)	206 (63.6)	

* Fisher's exact test.
† Wilcoxon rank sum test.
‡ Occupational level by self-report.
§ Includes informal housing.
IQR = interquartile range; HIV = human immunodeficiency virus.

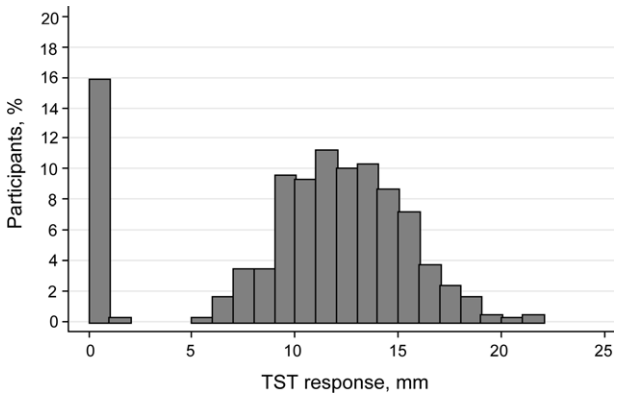

Figure 1 Overall distribution of TST responses (n = 429). TST = tuberculin skin test.

⩾30-year group). The prevalence of definite silicosis was 17/425 (4%), that of previous TB was 16/426 (3.8%) and that of active TB was 2/426 (0.5%).

Distribution of TST responses

Among 361/429 (84.1%) participants with a non-zero response, the response size was normally distributed: mean (standard deviation [SD]), mode and range for TST response were 12.35 mm (2.95), 12 mm and 1.4–21.83, respectively. There were very few TST responses between 1 and 5 mm (Figure 1).

Of the 33 HIV-positive participants, 15 (45.5%) had a zero TST response, compared to 15/115 (13%) and 38/281 (13.5%) with zero TST response in the HIV-negative and HIV status unknown categories, respectively (χ^2, $P < 0.001$) (Figure 2). In participants with TST >0, there was no significant difference between the size of response by HIV status (mean [SD] widths for HIV-positive, HIV-negative and HIV status unknown were respectively 11.84 [2.75], 12.03 [2.75] and 12.52 mm [3.04], analysis of variance [ANOVA], $P = 0.28$); age stratum (mean [SD] widths for <30 years and ⩾30 years were respectively 12.12 [2.90] and 12.42 [2.97], t-test $P = 0.41$); or presence of BCG scars (mean [SD] widths for participants with scar, without scar and with indeterminate scar were respectively 12.22 [2.89], 12.46 [3.16] and 12.9 [2.69], ANOVA, $P = 0.42$).

The distribution of TST responses was similar, irrespective of the presence of bacille Calmette-Guérin (BCG) scars, with modes at 10, 11 and 12 mm for participants with scar, without scar and with indeterminate scar, respectively (Figure 3). BCG scar status did not affect the presence of TST response: 42/266 (15.8%) participants with BCG scars, 17/121 (14.1%) with no scars and 9/42 (21.4%) with indeterminate scars had a zero TST response (χ^2, $P = 0.5$). Results by participant self-report of BCG vaccination were similar.

The distribution of TST responses was similar for both age groups, with modes of 12 and 13 mm for the <30 and ⩾30 year age group, respectively (data not shown).

Prevalence of LTBI

Applying CDC criteria for positive TST, the prevalence of LTBI was between 66.4% (when we assumed that all HIV status unknown participants were HIV-negative) and 77.6% (when we assumed that all HIV status unknown participants were HIV-positive) (Table 2). Using the mirror method for a mode of 12 mm, the overall prevalence of LTBI was 89%, compared to 18.4% if we assumed a mode of 16 mm, typical of the distribution of TST responses in patients with active TB.[13–15] There was little difference in the prevalence

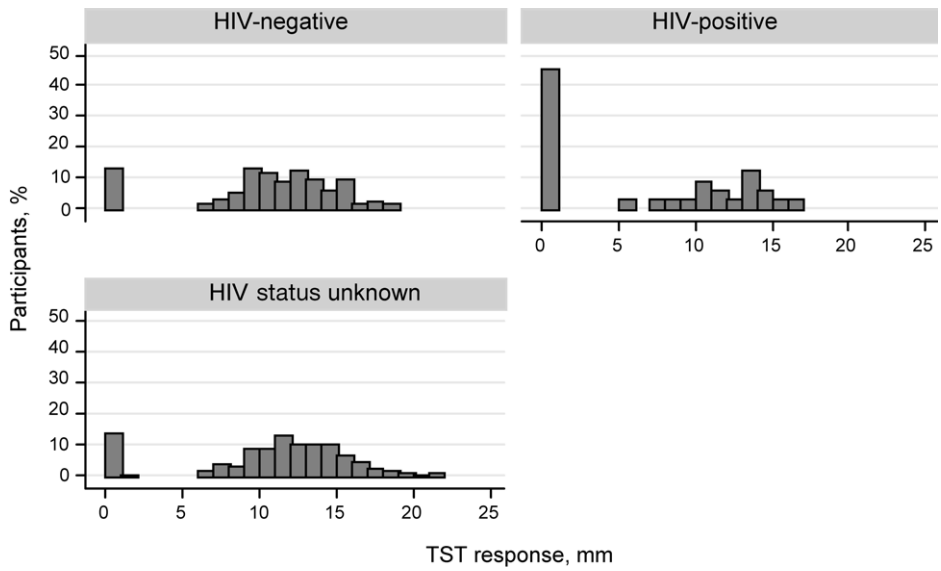

Figure 2 Distribution of TST responses by HIV status. HIV-negative (n = 115); HIV-positve (n = 33); HIV status unknown (n = 281). TST = tuberculin skin test; HIV = human immunodeficiency virus.

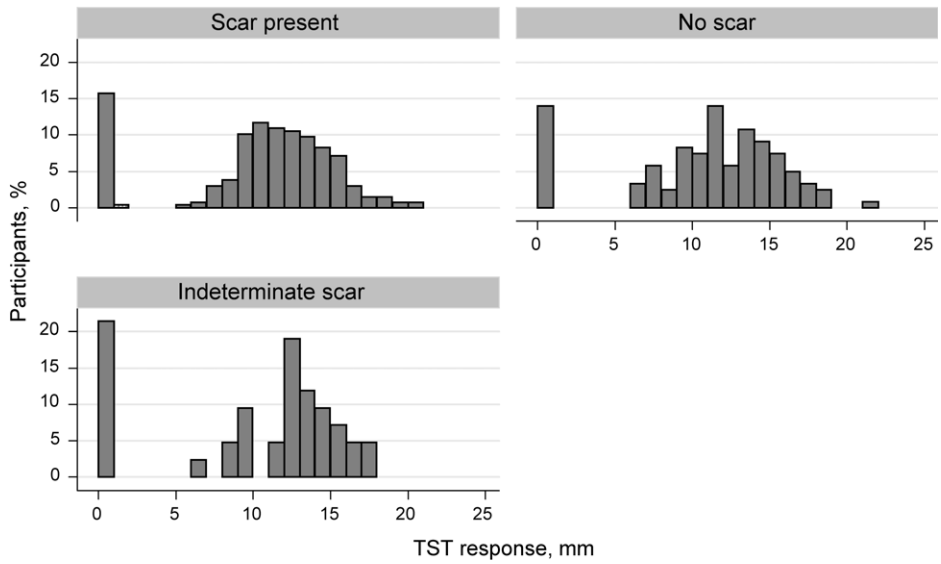

Figure 3 Distribution of TST responses by BCG scar presence. Scar present: $n = 266$; no scar: $n = 121$; indeterminate scar: $n = 42$. TST = tuberculin skin test; BCG = bacille Calmette-Guérin.

of positive TST between the age strata or presence of BCG scars. Applying CDC criteria, the range for prevalence of LTBI in the <30 year stratum was 61.0–73.3%, in the ⩾30 year stratum it was 68.2–79.0%, in participants with BCG scars it was 66.9–78.2%, in those without BCG scars it was 66.9–81.0% and in those with indeterminate BCG scars it was 61.9–64.3%.

Factors associated with a positive TST

In the univariable analysis (Table 3) of risk factors for a positive test (defined as TST ⩾ 10 mm) for LTBI, a positive TST was associated with male sex, black ethnicity, current frequency of underground work at least twice a week, no history of isoniazid preventive treatment (IPT) and HIV-negative or HIV status unknown. Age ⩾ 50 years and definite silicosis were also associated with a higher, but not statistically significant, odds of a positive TST. After multivariable analysis (Table 3) adjusting for age, current frequency of underground work, history of TB or IPT, and HIV status, only positive HIV status (aOR 0.41, 95% confidence interval [CI] 0.17–0.96) and never having worked underground (aOR 0.25, 95%CI 0.09–0.71) remained significantly associated with a positive TST.

Table 2 Prevalence of positive TST response using different criteria

Criterion	Positive TST *n*	Prevalence of positive TST ($n = 429$) %	95%CI
TST ⩾ 5 mm	360	83.9	80.4–87.4
TST ⩾ 10 mm	281	65.5	61.0–70.0
TST ⩾ 15 mm	69	16.1	12.6–19.6
TST ⩾ 5 mm for HIV-positive, TST ⩾ 10 mm for HIV-negative and HIV status unknown	285	66.4	61.9–70.1
TST ⩾ 5 mm for HIV-positive and HIV status unknown, TST ⩾ 10 mm for HIV-negative	333	77.6	73.7–81.6
Mirror method with mode at 12 mm	382	89.0	85.7–91.8
Mirror method with mode at 16 mm	79	18.4	14.9–22.4

TST = tuberculin skin test; CI = confidence interval; HIV = human immunodeficiency virus.

DISCUSSION

Prevalence of LTBI

Given the very high incidence and prevalence of active TB among South African gold miners, we anticipated a high prevalence of LTBI in this population,[16] and our TST results are consistent with this. The estimated population prevalence of LTBI varies according to the method of calculation. The mirror method gets around the problem of a high prevalence of zero response among HIV-positive individuals, and it is therefore likely the best method for our population; it is, however, highly dependent on the position of the mode.[11] Our observed mode of 12 mm gives an estimated prevalence of 89%, which is high but plausible. A mode at 12 mm is consistent with a recent TST survey of nursing and polytechnic students in Zimbabwe, where the modes were 9 and 8 mm respectively,[17] but contrasts with surveys in South Africa, where modes of 20 mm[15] in a low HIV prevalence urban setting and 16 mm[18] in a rural setting (excluding HIV-infected individuals) were recorded. The distribution of true *Mycobacterium tuberculosis* responses, as determined by TST response among TB patients, is most often symmetrical around a central mode, at 16–17 mm.[13–15] However, an assumed mode of 16 mm

Table 3 Risk factors for positive TST, defined as TST response ⩾ 10 mm (n = 429)

	TST-positive (n = 281)					
Risk factor/category	Prevalence n/N	%	Unadjusted OR (95%CI)	P value	Adjusted OR* (95%CI)	P value
Sex						
Male	279/422	66.1	1.0	0.045		
Female	2/7	28.6	0.21 (0.04–1.07)			
Age category, years						
19–29	64/105	61.0	1.0	0.17	1.0	0.22
30–39	67/98	68.4	1.38 (0.78–2.47)		1.46 (0.81–2.64)	
40–49	81/132	61.4	1.02 (0.60–1.72)		1.17 (0.68–2.02)	
⩾50	69/94	73.4	1.77 (0.97–3.23)		1.84 (0.99–3.41)	
Ethnic origin						
Black	281/421	66.8		<0.001		
White	0/8					
Residence						
Hostel	181/272	66.5	1.0	0.82		
House	83/131	63.4	0.87 (0.56–1.34)			
Other	17/26	65.4	0.95 (0.41–2.21)			
Occupational level						
Unskilled labour	269/407	66.1	1.0	0.23		
Skilled labour	7/10	70	1.2 (0.30–4.70)			
Professional	5/12	41.7	0.37 (0.11–1.18)			
Current frequency of underground work†						
⩾Twice a week	275/411	66.9	1.0	0.005	1.0	0.007
Never	6/18	33.3	0.25 (0.09–0.67)		0.25 (0.09–0.71)	
Duration of employment, years						
<10	90/139	64.8	1.0	0.068		
10–19	81/128	63.3	0.94 (0.57–1.55)			
20–29	59/92	64.1	0.97 (0.56–1.69)			
⩾30	50/65	76.9	1.81 (0.93–3.56)			
Not known	1/5	20	0.14 (0.01–1.25)			
Reported TB contact in last 1 year						
Yes	38/59	64.4	1.0	0.91		
No	195/299	65.2	1.04 (0.58–1.85)			
Don't know	48/71	67.6	1.15 (0.56–2.39)			
BCG scar						
Present	175/266	65.8	1.0	0.88		
Absent	80/121	66.1	1.01 (0.64–1.6)			
Indeterminate	26/42	61.9	0.85 (0.43–1.66)			
History of TB‡						
Yes	22/38	57.9	0.70 (0.36–1.38)	0.31	0.96 (0.44–2.10)	0.35
No	259/391	66.2	1.0		1.0	
History of ART in HIV-positive patients‡§						
Yes	4/11	36.4	0.69 (0.15–3.04)	0.62		
No	10/22	45.5	1.0			
History of IPT‡¶						
Yes	7/15	46.7	0.45 (0.16–1.26)	0.13		
No	274/414	66.2	1.0			
Silicosis						
Definite (⩾1/1)	13/17	76.5	1.75 (0.56–5.47)	0.60		
Possible (0/1;1/0)	5/8	62.5	0.90 (0.21–3.81)			
No silicosis (0/0)	260/400	65	1.0			
Previous TB on CXR						
Yes	10/16	62.5	0.87 (0.31–2.45)	0.80		
No	269/410	65.6	1.0			
Active TB on CXR						
Yes	1/2	50	0.53 (0.03–8.46)	0.65		
No	278/424	65.6	1.0			
HIV status						
Positive	14/33	42.4	0.42 (0.19–0.93)	0.01	0.41 (0.17–0.96)	0.04
Negative	73/115	63.5	1.0		1.0	
Unknown	194/281	69	1.28 (0.81–2.02)		1.18 (0.74–1.89)	

*Adjusted for age, current frequency of underground work, history of IPT, history of TB and HIV status.
†Two participants worked underground twice a week, and 409 worked underground fulltime.
‡Self-report or from medical records.
§All participants with history of ART were confirmed HIV-positive from self-report or medical records.
¶17/18 participants with history of IPT were also confirmed HIV-positive.
TST = tuberculin skin test; OR = odds ratio; CI = confidence interval; TB = tuberculosis; BCG = bacille Calmette-Guérin; ART = antiretroviral treatment; HIV = human immunodeficiency virus; IPT = isoniazid preventive treatment; CXR = chest radiograph.

gives an implausibly low estimate of the prevalence of LTBI in our population.

In the 1960s, only 11.1% of almost 2000 new recruits to a South African gold mine were Heaf grade zero,[8] similar to our current 84.1% prevalence of a non-zero Mantoux result. In the 1960s and 1970s, the annual risk of TB infection in labour-sending areas was very high,[19,20] subsequently declining as TB control improved.[19,20] The only more recent estimate of LTBI prevalence amongst gold miners was 99% (Mantoux > 9 mm) from a 1990s survey of 240 miners with silicosis.[7] This high prevalence is not surprising, as silicosis is a strong risk factor for TB, but it suggests that silicosis could also be a risk factor for LTBI. Our results are consistent with such an association, with an OR of 1.75 for a positive TST among individuals with definite silicosis, although our study was not designed to investigate such an association and the CIs include 1. The prevalence of LTBI did not differ in the <30 vs. ⩾30 year age strata, which could be due to a high prevalence of TST positivity among young adults in labour-sending areas, in keeping with other South Africa data.[18,21] Alternatively, the high intensity of TB exposure in the mine environment could result in a rapid increase in the prevalence of LTBI after joining the workforce, often at age 18 years.

Our lack of low-grade TST responses is in keeping with data both from adults in South Africa[21] and from a TST survey of children aged 6–11 years, where the mode was 15 mm and very few children had indurations of ⩽5 mm (C Sismanidis, personal communication). The prevalence and degree of sensitisation to non-tuberculous mycobacteria (NTM), and hence the specificity of TST, varies greatly with geography.[13,14] In pre-HIV era surveys in rural Malawi, where there was high exposure to NTM, very few low-grade TST responses were found, and indurations due to NTM were thought to cluster around 10 mm.[22,23] HIV-negative gold miners in South Africa have a high incidence (66 per 100 000 person-years) of *M. kansasii* disease,[24] and NTM were found in 18.2% of environmental samples from mine shafts.[8] Similarly, in our setting, the paucity of low-grade TST responses may be due to a greater degree of sensitisation to NTM, generating TST responses extending into the 6–12 mm zones,[12,13] and contributing to our mode at 12 mm.

We found a high percentage of zero TST responses amongst HIV-infected participants. Given the high incidence of TB among gold miners with HIV infection, it is unlikely that this reflects an absence of latent or recent TB infection in these individuals. We found that the size and distribution of positive TST responses did not differ by HIV status, consistent with data from US injecting drug users and Tanzanian TB patients.[15,25] These findings support the hypothesis that HIV infection may result in a loss of ability to mount a response to tuberculin, but does not cause diminution of the size of TST reaction.[15,25]

We found no difference in TST response by BCG status, in keeping with other data suggesting that the effect of BCG given in infancy on TST responses in adulthood is minimal.[26]

Risk factors for a positive TST (⩾10 mm)

In our study, the strongest risk factors associated with a positive TST were negative HIV status and current underground work. HIV infection, silicosis, older age, underground work and dusty occupations such as drilling are strong risk factors for pulmonary TB disease (PTB) among gold miners in South Africa.[1,27,28] A recent survey in gold miners aged >37 years showed that PTB is significantly associated with dust and silica exposure, independently of the presence of silicosis. This study recommended urgent dust control measures in addition to TB control measures to halt the epidemic of PTB in gold miners.[29] The strong association in our study between positive TST and current underground work, where dust and silica exposure are higher, is consistent with the idea that that they may also be risk factors for LTBI.

We chose the conventional[10] ⩾10 mm cut-off to define a positive TST for our risk factor analysis, given that laboratory-confirmed HIV results were available for a minority of participants. A 5 mm cut-off would have given greater sensitivity, but at the expense of possible reduction in specificity, if indeed some <10 mm responses were attributable to NTM. In addition, the very small number of individuals with TST <5 mm meant that we had low statistical power for comparisons with this cut-off.

Strengths and limitations of the study

Our study was based on a representative sample of the workforce, which is a strength; a limitation was the absence of data on current HIV status. We therefore had to rely on self-report and information in the medical records as a surrogate. This has had some impact on our estimation of LTBI prevalence using CDC criteria (ranging between 66.4% and 77.6%, depending on whether HIV status unknown participants were assumed to be HIV-negative or HIV-positive, respectively), but may have had a greater impact on our risk factor analysis for positive TST, as HIV status was not known for 69% of participants with TST ⩾ 10 mm.

CONCLUSIONS

The prevalence of LTBI of 89%, using the mirror method and the observed mode of 12 mm, highlights the scale of the TB problem among South African gold miners. It provides justification for a community-wide intervention with TB preventive treatment, as the great majority of individuals are likely to gain individual benefit from IPT, with the potential for additional benefit from a community intervention aiming to reduce TB transmission.

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RÉSUMÉ

CONTEXTE : Les mines d'or d'Afrique du Sud.
OBJECTIF : Déterminer la prévalence de l'infection tuberculeuse latente (LTBI) et les facteurs de risque d'un test tuberculinique cutané positif (TST) chez les mineurs d'or.
SCHÉMA : Enquête transversale. On a déterminé le statut du virus de l'immunodéficience humaine (VIH) par les déclarations spontanées et par les dossiers médicaux. Pour évaluer la prévalence de la LTBI, la positivité du TST a été déterminée par la méthode en miroir et, pour l'exploration des facteurs de risque de niveau individuel, par les critères des Centers for Disease Control and Prevention.

RÉSULTATS : Sur 429 participants (105/130 agés de <30 ans ; 324/390 agés de ⩾30 ans), la prévalence estimée de la LTBI est de 89%. Une réponse nulle au TST a été observée chez 45,5% des participants séropositifs pour le VIH et chez 13% des séronégatifs et chez 13,5 des participants à statut VIH inconnu. Chez les participants dont le TST est >0, on ne note pas de différence significative de la taille de la réponse en fonction du statut VIH : les largeurs moyennes (déviation standard) sont de 11,84 mm (2,75) chez les séropositifs pour le VIH, de 12,03 mm (2,75) chez les séronégatifs pour le VIH et de 12,52 (3,04) chez les participants à statut VIH inconnu (ANOVA $P = 0,28$). Les facteurs associés de manière indépendante à un TST < 10 mm sont le statut VIH-positif (aOR 0,41 ; IC95% 0,17–0,96) et le fait de ne pas travailler dans le fond de la mine (aOR 0,25 ; IC95% 0,09–0,71).

CONCLUSIONS : Chez les mineurs d'or d'Afrique du Sud, la prévalence de la LTBI est très élevée. Les sujets infectés par le VIH sont plus susceptible d'avoir un TST négatif, mais l'infection par le VIH n'a pas d'influence sur la dimension de la réaction TST.

RESUMEN

MARCO DE REFERENCIA : Las minas de oro en Sudáfrica.

OBJETIVO : Determinar la prevalencia de infección tuberculosa latente (LTBI) y los factores de riesgo de tener una prueba cutánea positiva a la tuberculina (TST) en los trabajadores de las minas de oro.

MÉTODOS : Fue este un estudio transversal en el cual se determinó el estado de la prueba serológica del virus de la inmunodeficiencia humana (VIH) por autorreferencia y a partir de las historias clínicas. La positividad de la TST se definió mediante la técnica del espejo con el propósito de calcular la prevalencia de LTBI y con los criterios de los Centros para el Control y la Prevención de las Enfermedades se examinaron los factores de riesgo a escala individual.

RESULTADOS : La prevalencia de LTBI calculada en los 429 participantes (105/130 <30 años y 324/390 de ⩾30 años de edad) fue 89%. El 45,5% de los participantes con serología positiva para el VIH tuvo una respuesta de 0 mm a la TST, comparado con el 13% de quienes tenían serología negativa y el 13,5% de aquellos cuya serología se desconocía. En los participantes con una reacción TST > 0 mm, no se observó una diferencia significativa del tamaño de la respuesta con respecto al estado de la serología (media 11,4 mm [desviación estándar : 2,75] en las personas con serología positiva ; 12,03 mm [2,75] en personas con serología negativa ; 12,52 mm [3,04] en los participantes con estado serológico desconocido ; ANOVA $P = 0,28$). Los factores asociados en forma independiente con una reacción TST < 10 mm fueron la serología positiva del VIH (aOR 0,41 ; IC95% 0,17–0,96) y el no ejercer trabajo subterráneo (aOR 0,25 ; IC95% 0,09–0,71).

CONCLUSIÓN : La prevalencia de LTBI es muy alta en los trabajadores de las minas de oro en Sudáfrica. Las personas infectadas por el VIH presentan mayor probabilidad de reacción TST negativa, pero la infección por el VIH no modifica el tamaño de la respuesta cutánea.