

Prevalence of Latent Tuberculosis Infection amongst Immigrants entering prison

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ABSTRACT

Objective: To study the prevalence of latent tuberculosis infection (LTBI) and the predictive factors amongst immigrants entering prison.

Methods: prospective study conducted in May and June of 2009. The tuberculin skin test (TST) was performed, with induration of ≥ 10 mm being regarded as positive. Variables collected were: age, origin, number of incarcerations, duration of stay in Spain, heroin and cocaine consumption, intravenous drug use and HIV infection. The rate of LTBI was calculated and the overall infection rate (ITL and history of TB). To study predictable factors, bivariate and multivariate analysis was carried out using logistic regression.

Results: 152 male immigrants. Average age: 31.9 years \pm 7.8; 37.2% of them with heroin or cocaine consumption and 7.5% IDU. 12 patients were previously TST positive and 6 patients had history of TB. TST was performed on 134 people, 63 with positive results and 71 with negative ones. ITL rate: 49.3. Overall infection rate: 53.3%. Bivariate associated with LTBI: more than one incarceration (67.4% vs. 36.4% in primary, $p=0.001$), age (76% ≥ 40 vs. 40.4% under this age and heroin and cocaine consumption (60% consumers vs. 39.3% non consumers; $p=0.02$). Multivariate analysis only confirmed the association with age ($p=0.001$; OR: 2.34, IC=1.39-3.94).

Conclusions: The LTBI rate amongst immigrants entering prison is very high. A complete study is recommended for all of them, with special attention being paid to the most vulnerable ones, such as older people.

Keywords: Tuberculosis; Mycobacterium tuberculosis; Latent Tuberculosis; Prisons; Prisoners; Emigration and Immigration; HIV; Prevalence; Tuberculin Test.

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INTRODUCTION

Tuberculosis infection is a relevant public health issue in our country and a previous condition for the development of Tuberculosis (TB). According to the WHO, in 2009 6,687 TB cases (new and relapses) were reported in Spain¹. The outstanding migratory movement experienced in Spain throughout the last decades in Spain is most probably influencing that

number, as it has done in other countries such as USA, Canada and several European countries². As stated by the National Statistics Institute, at the beginning of 2011, 14.1% of the total registered population in Spain was foreign³. Currently, Morocco, Ecuador, Romania and Colombia are four of the countries where most of the Spanish immigrants come from. Apart from the aforementioned percentage we should also consider a significant number

of people who illegally reside in Spain and who are therefore not registered. This would entail that the total number is actually higher.

In Barcelona there is a TB control program which asserted a significant fall in the report of this disease (10% yearly) until the beginning of 2000, when such reduction dropped to 3-4% every year⁴. This trend change coincided with demographical changes observed in the city, where the number of immigrants has significantly grown in a few years. They usually come from developing countries (DP) where high TB endemic rates can be found.

In Cataluña, high rates of immigrants enter prison. In this community, inmates under detention outweigh national inmates 4:1⁵. Many of these immigrants come from developing countries where they lack an appropriate healthcare system and frequently live there under precarious conditions, which do not always improve when arriving to Spain. All this leads to a high prevalence rate of latent tuberculosis infection (LTBI) among these individuals. On the other hand, TB patients with AFB smear positive results yet not diagnosed disease, entail a high risk for the transmission of the disease since prisons are enclosed precincts which facilitate the spread and there are still facilities where inmates live in small rooms with inappropriate ventilation. It is therefore highly recommended that interventions aimed at identifying infected inmates and ruling out TB upon imprisonment be done as to treat the infection and the disease, and avoid its transmission. Nevertheless, it may be possible that such interventions should be preferably carried out in the immigrant collective, especially in some unidentified sub-groups. The objective of our paper is to study the prevalence of LTBI in imprisoned immigrant population as well as to evaluate any predictive factors regarding the infection.

MATERIAL AND METHODS

Prospective and cross-sectional study conducted between May and June 2009 among those inmates hosted in the Male Prison of Barcelona. Thorough anamnesis was conducted as well as TB screening according to the protocols implemented in prisons in Cataluña. TST took place by means of 2U of PPD RT 23. The test was considered positive when induration measurement after 48-72 hours, was of 10 mm or more^{6,7}. TST was not conducted in the following cases: a) previous positive result, b) previous history of TB, and c) when the test had been conducted in a period of ≤ 15 days, to avoid false positive results due

to booster or rebound effect in patients previously vaccinated.

In order to know whether inmates had a previous positive result for TST or a previous history of TB, clinical records were consulted, since these are computerized since 2002 and they gather all healthcare interventions and diagnostic tests undergone by inmates and is shared by all prisons in Cataluña.

The following variables were considered: a) age, b) origin, c) recidivism, d) duration of stay in Spain, e) heroine and/or cocaine consumption, f) intravenous drug use and g) HIV serology. Recidivism was defined in terms of those who had been imprisoned more than once.

Patients with a positive TST were derived to the TB diagnosis and control program so that any needed complementary tests were conducted.

LTBI and overall TB infection (OTBI) rates were calculated: individuals with LTBI plus those with a previous record of TB. Statistical analysis was conducted by means of the SPSS-PC software. Descriptive data was initially expressed as absolute numbers, percentages, means and their standard deviations. In order to establish the association between qualitative variables, chi-squared test and Fisher's exact test were used. In order to identify predictive variables, bivariate and multivariate analysis was conducted using logistic regression and calculating the odds ratio with 95% confidence intervals.

RESULTS

152 immigrants entered prison: 12 out of these had a previous positive result for TST and 6 had a history of TB so therefore, 134 individuals underwent TST.

In view of the features of the prison all inmates were male and over 21 years old. The average age was 31.9 years (SD \pm 7.8). 96.1% came from developing countries, mostly from Arab countries (38.8%) and from Latin America (26.9%), while those original from other geographical areas were less represented (n=52; 34.3%). As far as penitentiary features, 34.3% were re-offenders while 65.7% had entered prison for the first time. 59% had lived in Spain for over 5 years and 12.7% for less than one. Only 7.5% declared to use or to have used intravenous drugs and only 22.4% had previously undergone HIV serology testing. Table 1 thoroughly depicts descriptive features of the population under study.

In 75 patients, TST was positive (63 upon imprisonment and 12 previously), which represented a LTBI rate of 49.3% the overall tuberculosis infection rate was 53.3% (see Figure 1)

Variable	n (%)
Mean age: 31.9 years (SD ± 7.8)	
Age groups	59 (44)
• ≤29 years old	50 (37.3)
• 30-39 years old	25 (18.7)
• ≥40 years old	
Re-offender	88 (65.7)
• No	46 (34.3)
• Yes	
Time of residence in Spain	17 (12.7)
• < 1 year	38 (28.3)
• 1-5 years	79 (59)
• > 5 years	
Heroin and/or Cocaine consumption	50 (37.3)
• Yes	84 (62.7)
• No	
Intravenous Drug Use	10 (7.5)
• Yes	124 (92.5)
• No	
HIV infection	2 (1.5)
• Yes	28 (20.9)
• No	104 (77.6)
• Unknown	

Table 1: Descriptive features of the population under study.

Table 2 depicts LTBI and OTBI rates according to the geographical origin of the cases under study. Overall TB infection was more frequent in individu-

Geographical Area	Imprisonment	LTBI (%)	TB (%)	OTBI (%)
• Latin America	37	48.6	5.4	54.0
• Northern Africa	54	42.6	1.9	44.5
• Sub Saharan Africa	8	75	0	75.0
• Eastern Europe	19	63.2	10.5	73.7
• Asia	13	30.8	7.7	38.5
Total	152	49.3	4	53.3

LTBI: Latent TB Infection; TB: Tuberculosis; OTBI: Overall TB Infection

Table 2: Prevalence of Latent TB Infection, TB and Overall TB Infection according to geographical origin of the population under study.

als coming from sub Saharan Africa, Eastern Europe and Latin America, and less in those from Northern Africa and Asia.

Variables associated with statistical significance to LTBI in the bivariate analysis (see Table 3) were: re-offence (67.4% vs. 36.4% in non re-offenders; p=0.001), heroine and/or cocaine consumption (60% vs. 39.3% in non-users; p=0.02) and age (76% in those who were 40 or over vs. 31.6% in those under that age; p<0.001). Multivariate analysis confirmed the independent association of LTBI and age (p=0.001; OR: 2.34, CI=1.39-3.94) as expected due to a longer exposure time, while the association with other variables was ruled out.

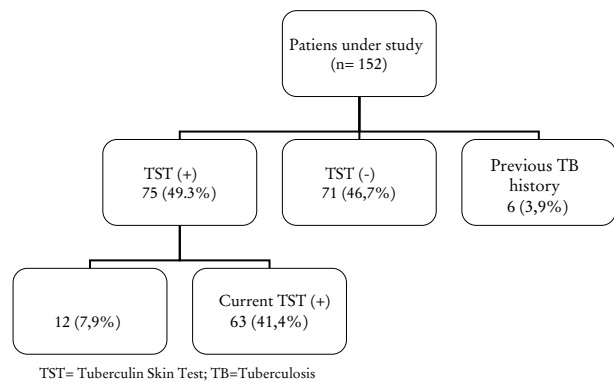


Figure 1: Distribution of patients under study according to TST or previous history of TB.

Variables	Bivariate Analysis		Multivariate Analysis	
	TB Infection n (%)	P	P	Odds Ratio (95% CI)
Age Groups				
• <40	44 (40.4)			1
• ≥40	19 (76)	<0.001	0.001	2.34 (1.39-3.94)
Arrival in Spain				
• <5 years	25 (45.5)			
• ≥5 years	38 (48.1)	0.94		
Re-Offence				
• No	32 (36.4)			1
• Yes	31 (67.4)	0.001	0.061	2.44 (0.96-6.19)
Heroin and/or Cocaine consumption				
• Yes	30 (60)			1
• No	33 (39.3)	0.02	0.55	0.76 (0.31-1.87)
IDU				
• Yes	7 (70)			
• No	57 (50)	0.32		
HIV				
• Yes	1 (50)			
• No	17 (60.7)	0.25		

Table 3: Variables associated to LTBI. Bivariate and Multivariate Analysis

DISCUSSION

The prevalence of LTBI among inmates is high, both in studies conducted in Spain^{6,7} as in other carried out in developing countries such as Pakistan (48%⁸), Nigeria (54.2%⁹) or Brazil (61.5%¹⁰), but is significantly lower in inmates coming from countries with better social and economic conditions, such as Italy (17.9%¹¹), Australia (13%¹²) or United States (17-20.1%^{13, 14}). Nevertheless, regardless of the type of country, the prevalence of both LTBI and TB among inmates is higher than in the general population. In fact, it has been estimated that in Europe the imprisoned population has up to 83.6 more times TB than the general population¹⁵. This is probably due to the intrinsic features (alcoholism, poverty, impaired social and economic conditions, etc.) of those imprisoned^{15, 16}, to the enhanced transmission of the disease within an enclosed precinct and, most of all, due to high endemic rates of TB among those who enter prison. The aforementioned may have been encouraged by an increased migratory phenomenon experienced by Spain since 2000², with a lot of individuals coming from developing countries, where high endemic rates are found for LTBI¹⁷⁻²¹. 48.7% of TB cases reported in Barcelona in 2009 concerned the foreign population²² and, on the other hand, 43.2% of

the imprisoned population in Cataluña had been born outside Spain²³.

In our paper, the prevalence of LTB among foreigners has been 49.3%, a very similar result to that found (51.2%) in the study by *García Guerrero et al*⁷, but significantly differing from that concluded by *Alonso et al*¹⁸, which was also conducted among foreigners but not inmates, in the Southern region of Toledo, where a LTBI rate of 27.7% was found. This data suggests that there are probably sociologic, and secondarily healthcare, differences between the immigrant collective which enters prison and that which doesn't. As far as this is concerned, it must be underlined that almost all of the inmates considered in this study (>96%) came from developing countries and that over 50% had had contact with *M. tuberculosis*. 59% had resided in Spain for over 5 years and presumably lived under precarious conditions before entering prison. In spite of such conditions, it is highly probable that they had already acquired the infection in their native countries²⁴. On the other hand, and unlike the national population, where there is an usual association between intravenous drug use (IDU), LTBI and HIV^{25, 26}, such correlation was not found among the immigrant population, who usually uses less intravenous drugs²⁷, although a great deal of those imprisoned had not undergone previous HIV testing.

This paper has concluded that only the age (the older age of those under study, the higher prevalence) has a significant association with LTBI. This predictive factor had been already asserted in other studies conducted both in Spanish prisons^{27, 28} and in other countries^{29, 30}.

In short, there are a lot of immigrants that have LTBI upon imprisonment. Although this results could be unlike those obtained in other Spanish prisons, in view of the intrinsic features of Barcelona and the population that it hosts, they are probably similar to other large urban centers in Spain which also have a large representation of immigrant population. We must also take into account that the Barcelona Male Prison is a detention facility and therefore, inmates always come from the outside and they differ from those inmates already convicted, who can come from other detention facilities where systematic health studies have already been conducted. All these issues, apart from a modest –although relevant– sample size, could be regarded as the main limitations of our study.

Finally, we would like to emphasize the importance of TB screening upon imprisonment, which is highly necessary even though the control of this disease in prison has improved throughout recent years^{31, 32}. Recently the Spanish Journal on Prison Health published a consensus document on TB³³, which recalled that currently TB is still a relevant issue. Therefore, we must remember not to lower our guard and keep recommending a complete study of all those imprisoned, especially of the most vulnerable groups, such as older immigrants.

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